WORK

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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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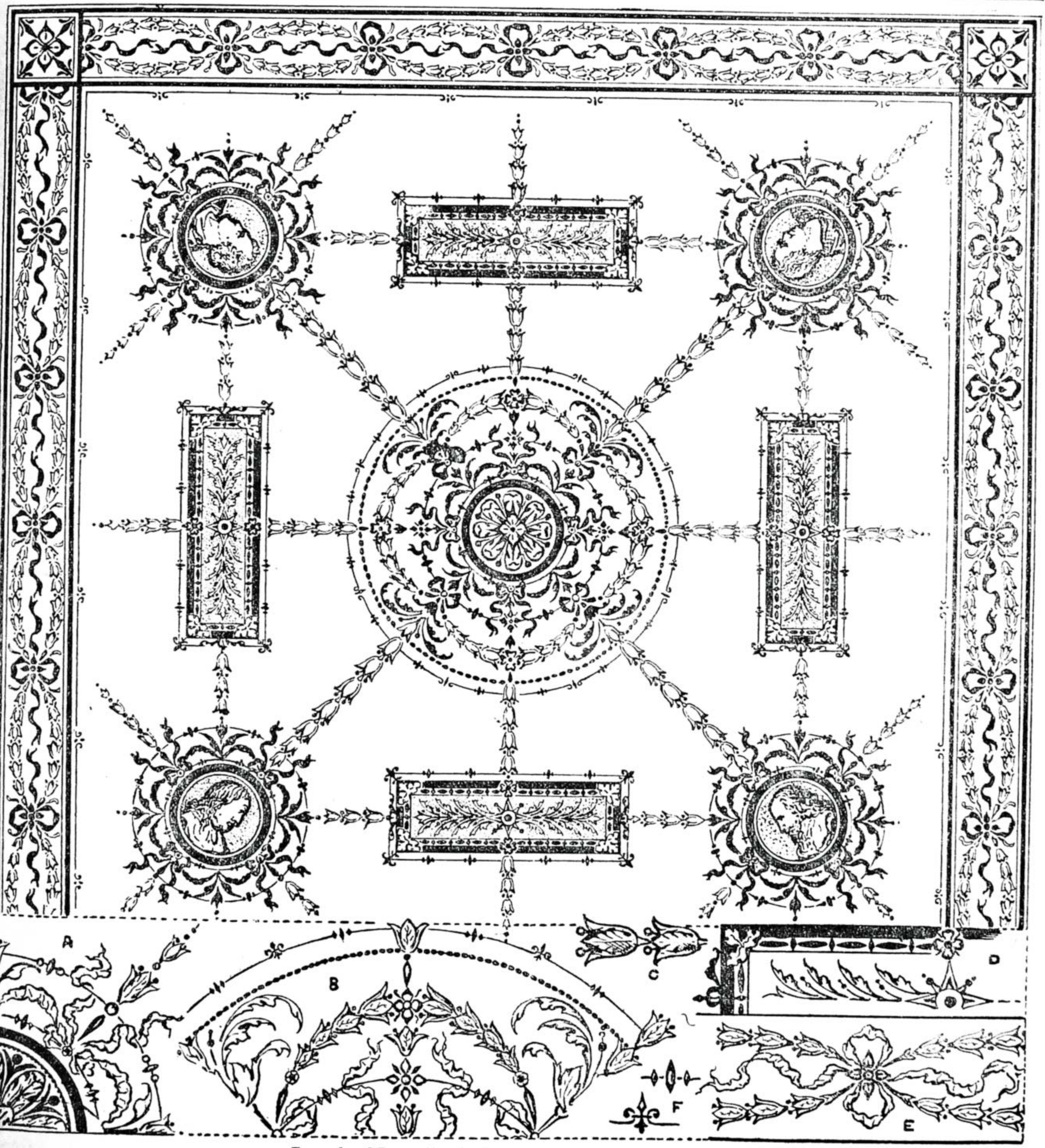

Example of Decoration in Stencil for a Sitting-Room Ceiling.

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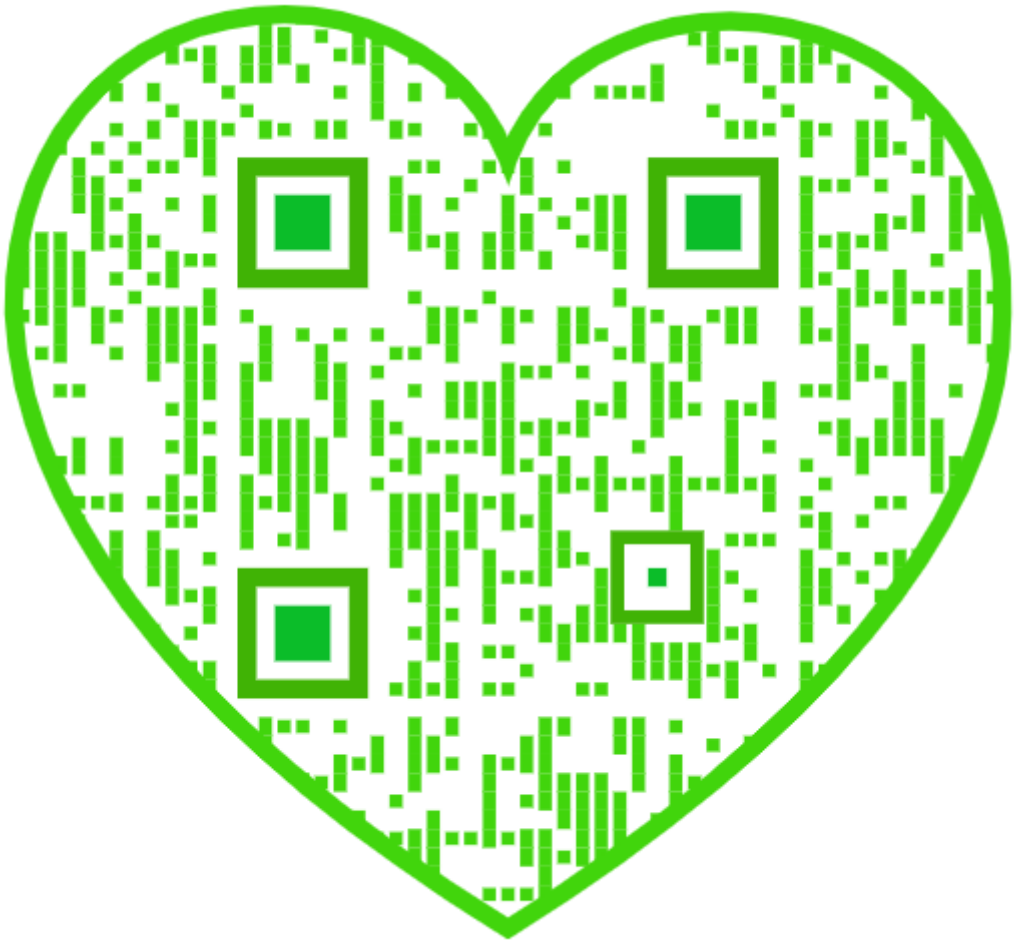

STENCILLED DECORATION FOR A SITTING-ROOM CEILING.

BY A LONDON DECORATOR.

In placing before the readers of WORK a design for the embellishment of a ceiling, I have endeavoured to keep in my mind the necessity of such decoration being so arranged as to be readily adaptable to various conditions and circumstances. In the first place, it must be mentioned that ornament which has to be executed by the stencil process must necessarily be of a somewhat disconnected nature, so that the "ties" which hold the stencil together may not appear as so many *patches*, but really help in the formation of the design. Ties in a stencil, which have afterwards to be made good by hand, are scarcely ever a necessity; more often a sign that the ornament is not specially drawn for the purpose, or else that a style of decoration is attempted which is outside the province of flat ornament. This will explain my reason for adopting ornament of the "Adams" type. It is seldom we find two ceilings, in different situations, of precisely the same size and shape, and therefore—the better to meet the probable requirements of the individual reader—the rearrangement of the panels will prove to be a comparatively simple matter. Again, many sitting-rooms are decorated (?) with a plaster centre-flower, and this article, irrespective of its suitability in design, would quickly upset any ornamental arrangement of an arbitrary nature or a more classic style. Lastly, I have endeavoured to meet the majority of readers with a decoration capable of giving a very pleasing effect, and that without making any extreme demand upon them for skilled draughtsmanship.

Some useful information on stencil cutting having been published in an earlier paper, I must refer the worker, who has not previously attempted such, to this for help and guidance, as I can only deal here with the execution of the design.

My drawing assumes a square ceiling—flat, without a centre-flower, fourteen feet each way, the scale being half-inch to the foot. Whatever may be the size and shape of the ceiling, it is advisable to make a plan of it, drawn to scale, from which to set out the ceiling and mark the position of each panel and ornament. The size the stencils have to be enlarged to will then be readily apparent. For a ceiling 14 ft. square, the diameter of the corner panels, measured within the fine, outer line, will therefore be 30 in. This would also be the average size of a plaster centre-flower for a room of such dimensions. Stencil A forms one quarter-section of the corner ornaments, the rosette in my complete drawing being replaced by a medallion in these four circular panels. Upon careful inspection of the large central ornament, it will be noticed that the inner portion is identical with the corners, and therefore is executed with the same pattern—stencil A. From this it follows that, given a ceiling with a centre-flower of equal diameter to the corner panels, the former will take the place of the inner stencil work. The majority of such plaster ornaments will be found to terminate at their outer edge in pointed forms at regular intervals apart. Stencil B, omitting the ends of ribbons shown, is of a nature that could be connected with such a plaster-centre, without any ugly break or false notion being conveyed to the eye.

The reader who has now carefully followed me will see that I have explained how to adapt the decoration to a ceiling *with* and *without* a centre-flower. In the event of the latter, however, being either larger or smaller, stencil B can be drawn to fit the plaster quite as easily as to the exact proportions of my drawing. The stencil C indicates an enlarged drawing of the clusters of conventional leaves which connect each portion. Of these the worker will require two lengths, one to reach from large panel to the outer ones, and a shorter length, as shown, of four clusters. The stencils for this are best made upon a long, narrow length of cartridge paper, drawn between two converging lines, and smaller, if anything, in proportion to those of my drawing. Each cluster should be quite intact and unconnected with the succeeding one.

Stencil D will require to be first used for making the diagonally opposite quarters of the oblong panels. It must then be cleaned, turned over, and thus complete the design. The border E should be drawn and cut upon a piece of paper 9 in. in width, the design being 8 in., and leaving a clear half inch at its widest parts. When this is applied to the border, a space on either side of 1½ in. is left, which is devoted to the fine line, a half-inch space, and then a half-inch line on either side of the border. F represents the simple forms which are used to relieve the fine lines within the border and surrounding the circular and oblong ornaments.

Supposing, therefore, the ceiling plan to be drawn according to the arrangement best suited thereto, and the stencils cut upon cartridge paper and coated once with patent knotting, I will give a few lines upon the groundwork.

If a comparatively new plaster ceiling and free from cracks, all old whiting having been washed off, it should be given a preparatory coat of warm, patent size. A decided "ivory white," so termed, or *cream* grounding is then applied. This should be jellied distemper, made strong with patent size, and the whiting stained to the required tint (determined by drying the same) with Raw Sienna ground in water—a ¼ lb. being ample for the half-pail required to ground the ceiling. If the ceiling is badly cracked, pay a paperhanger to fix a stout lining paper all over, first sizing the ceiling and stopping the cracks. The distemper is then coated directly on the lining paper.

The tools and material required to complete the decoration are a length of stout crochet cotton, about six yards, one piece of soft willow charcoal, a rule, a wooden straightedge with bevelled edge, about 30 in. in length, a stencil tool, a lining fitch (both of medium size), about a pound of thin flatting paint (made from white lead, Japan gold size, and "turps"), a little blue pigment ground in oil (Antwerp or Prussian), and, lastly, which need hardly be specified, a pair of tall steps, a hammer, and tacks.

With these at hand, I will now describe how, single-handed, the decoration may be executed. A start is made by marking a point 12 in. (the width of border) from the cornice on two adjacent sides, at both ends. A tack is fixed at the point where the ends of our lines will cross each other; the crochet cotton—the best "chalk line" for decorators—is now tied to the tack, and the line is strained to the mark at the other end with the left hand and snapped with our right. Still from the tack in the same place, a diagonal line across the ceiling is marked, rubbing the charcoal each time along the chalk line so that the mark is plainly visible. The tack is now removed to the diagonally opposite corner, and thus the border space and diagonals are set out. By the same means the ceiling is divided into four equal parts; and finally, lines are struck from the diagonals at a point which marks the position of corner panels and gives us the centre line of the oblong ones. All these lines of the plan are plainly indicated by the design itself, and are, indeed, easier to discover than to describe by the pen. No reader who can enlarge and cut the stencils can fail to succeed in adapting them to his own exigencies if my directions are followed. Although, if accurately drawn, the ornament is bound to fit in and form correct outlines, it is advisable to mark out the circumference of the circular corners and the lines dividing same into quarter-sections. To obtain the circles, a wire nail is fixed at centre-point, and a lath cut with two holes, the distance apart corresponding with the radius of circle. One hole is put over the nail and a lead pencil in the other, and thus the circle is drawn.

In stencilling it is necessary to fix the pattern to the ceiling with a few tacks, holding each part close to the work as we go over it to ensure clean, sharp ornament. The square pateras at each angle of the border are simple in character, and these, with the border lines, are executed at the last, the latter with the straightedge and lining fitch.

Now, as to *colour*. The decoration is intended to be stencilled solely in one contrasting colour upon the decided cream ground. The flatting paint is stained to a light "Cambridge" or "electric" blue, the design stencilled, and the lines run with one and the same colour. The paint will dry quickly and with no practical alteration in depth; so we know, without trying and drying, the finished effect. If the distemper ground is made quite *strong* with patent size, the turps-colour will stencil clean, and without a dark edge or sign of the colour running upon it. Distemper stencil work upon distemper ground makes coarse, rough work, and the stencils are soon affected by the water. The "flatting" is really more a blue stain than a paint, and is to every practical purpose far superior for stencilling upon distemper. My object in making the drawing chiefly black upon white has been to show the ornament plainly for copying. The effect of a light, "greeny" blue upon cream is so much the more chaste, delicate, and harmonious that the drawing gives no true notion of the finished effect.

For a room without a centre-flower, the average worker may content himself with using the rosette—placed in centre of large panel only, in illustration—for the corner panels also. If the cameo heads are used, they may be painted in blue monochrome of oils against a background of gold. Prepared canvas, coarsely stippled, should be cut to fit the position, and fixed with a paste of white lead and varnish after they are painted, due care being taken as to the relief and lighting implied. If without the gilded background, "old ivory" colour heads in monochrome on blue ground, and wide margin line of gold, would suit equally well. The introduction of such heads, as my illustration suggests, of British poets—Scott, Byron, Shakespeare, and Milton—if properly painted, would raise the art status of the ceiling decoration from the purely *æsthetic* sphere—which pleases the senses chiefly—to the higher grade of *phonetic*

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decoration—that which appeals to the mind and understanding also.

I should add that the "ivory and blue" scheme will accord with nearly all wall hangings of a *conventional* design suitable for drawing-rooms, excepting the papers which contain very much red or any green. With a wall in terra-cotta shades, the ground might be a faint warm tint, and the stencil of a darker tone to correspond with the walls. Green for a drawing-room is not worth considering here. For the benefit of readers who may desire to possess a room in character throughout, I may state that "Adams" designs of good wall hangings are now both fashionable and easily procurable; whilst for those who may prefer the equally modern plain-colour filling with frieze decoration, I venture to hope the ornamental treatment of door and walls may, in the future, be added to this ceiling design.

PRACTICAL DETAILS OF BOOKBINDING.

BY GILBERT CLARKSON.

FOLDING AND STITCHING—SIZES OF PAPER, ETC.—MACHINES FOR FOLDING AND STITCHING.

THE first operation in bookbinding is that of folding. It is one which requires great care if the book is wanted to have a decent appearance when bound. It is usual for printers to leave more margin to the outsides of the sheet, so that, when they have been folded, the margin will be broader at the fore-edge and tail than at the head and back. The head and back are always at the fold, the tail and fore-edge being towards the outside of the sheet. If the paper presents any little difference in size, these two latter edges being cut first in the process of binding, it will then be taken off, and the margin will be the same all round.

There is nothing more offensive to a careful reader than a badly-folded book. The best plan, therefore, and the one adopted, is to fold to the pages, and not to the edge of the paper, for the least variation in the size of the sheet would result in a spoiled book.

Papers are made in various sizes, and are known by the following terms: Imperial, royal, demy, crown, foolscap, and pot; and the sizes of books are denominated according to the number of leaves into which the sheet is folded. The ordinary sizes are folio, 4to, 8vo, 12mo, 16mo, 24mo, and 32mo. A sheet, when folded up, has twice as many pages as leaves, for the simple reason that it is printed on both sides. In speaking of the size of *The Quiver*, for example, we would say that it is a royal 8vo, because the sheet has been folded one-eighth its original size, and has 16 pages. The octavo is the most general size of a book, and the type matter is so imposed that, when the sheet is folded, the sixteen pages will follow consecutively.

Figs. 2 and 3 will show what I mean. Fig. 2 is the outside of the sheet, and Fig. 3 is the inside.

In commencing the operation of folding, lay the sheet out flat on the table, as in Fig. 3—*i.e.*, with the inside uppermost, page 3 at the bottom right-hand corner. Take the folder in the right hand and, with the left, take up the sheet at page 3, and bring it over to the left, adjusting pages 3 and 6 evenly on the top of pages 2 and 7, and draw the folder over the sheet, thus making the first fold.

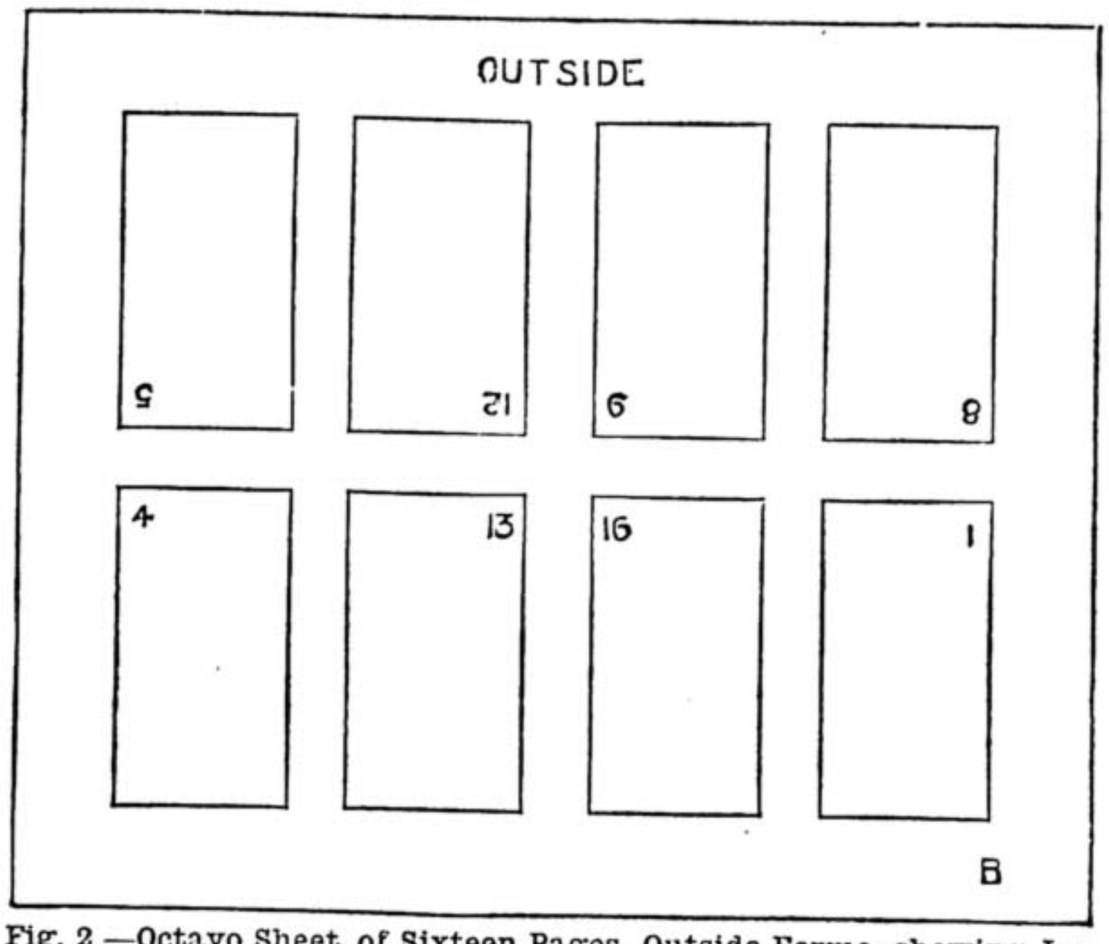

Fig. 2.—Octavo Sheet of Sixteen Pages, Outside Forme, showing Imposition of Pages and Signature.

The sheet will now be half the original size, and will have the appearance of Fig. 4—*i.e.*, pages 4 and 13 and 5 and 12 will be uppermost. Now take hold of the sheet by the top right-hand corner—*i.e.*, at the bottom of page 12—with the left-hand, and bring it over so that the type matter at the bottom of page 12 will fall exactly on the matter on page 13. Draw the folder over the sheet again, reducing it to one-fourth its original size. The sheet will now have the appearance of Fig. 5, and pages 8 and 9 will now be uppermost. For the last fold take hold of the sheet at the left-hand corner (page 8), give it a half-turn on the table, place page 8 over page 9, and draw the folder again over it. The sheet will now be one-eighth its original size, having been folded three times, and it will now have the appearance of Fig. 6, and will have been correctly folded, and the pages will follow consecutively from 1 to 16. I have selected the 8vo sheet for description because it is the one most generally used, and all the others are folded somewhat on the same principle.

A 12mo sheet is the same as the 8vo with other 8 pages added. The first and last pages form the 8vo portion, and is folded as already described. The other 8 pages is cut off and folded by itself and *inset* into the other portion—*i.e.*, put into the centre of it. A little more care will be necessary to ensure the figures and head-lines falling upon each other.

An 18mo sheet consists of a 12mo and a half, and forms 36 pages.

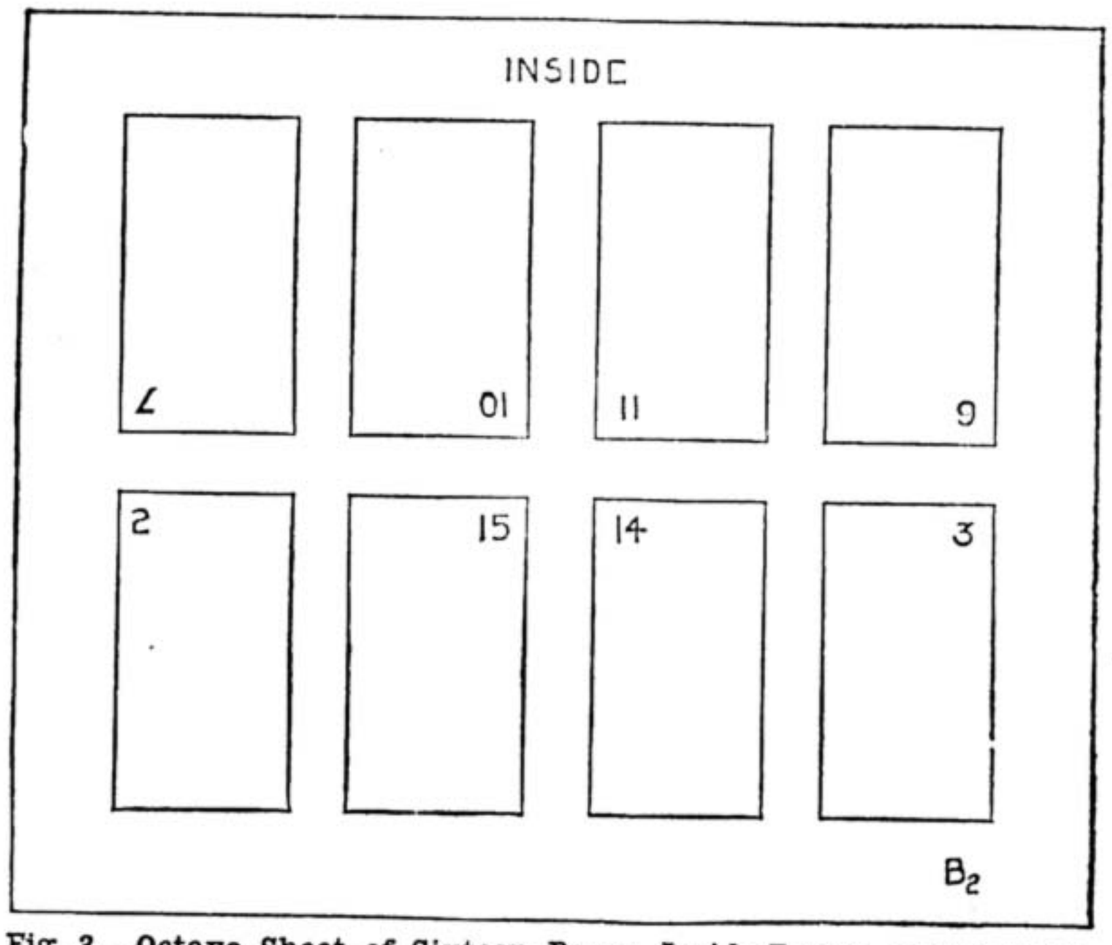

Fig. 3.—Octavo Sheet of Sixteen Pages, Inside Forme, showing Imposition of Pages and Signature.

Attention to the signatures, which will always be found on the first page of the sheet, will keep the operator right.

The sheets of a book are all folded in the same manner and laid together—*i.e.*, all sheets bearing the same signature are knocked up and tied in 50's or 100's, and put carefully away until the entire edition is folded.

In large establishments, folding is executed by machinery. These machines are very useful, for without their aid it would be impossible for binders to turn out such a large amount of work as they are called upon to do in the given time. There are a great many machines in the market, and it would be difficult to say which is best.

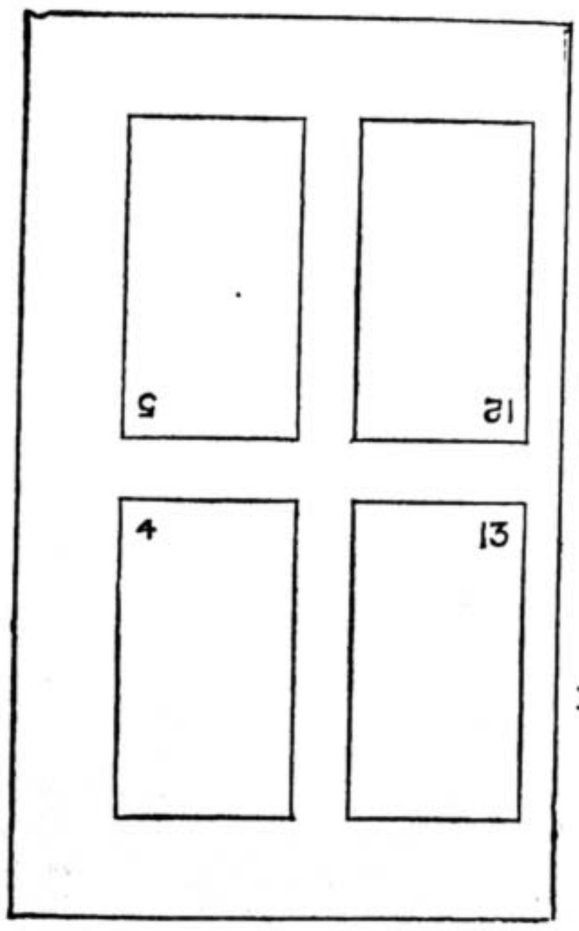

Fig. 4.

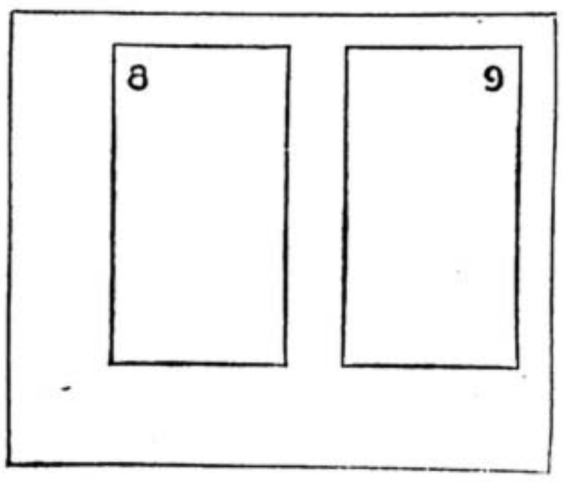

Fig. 5.

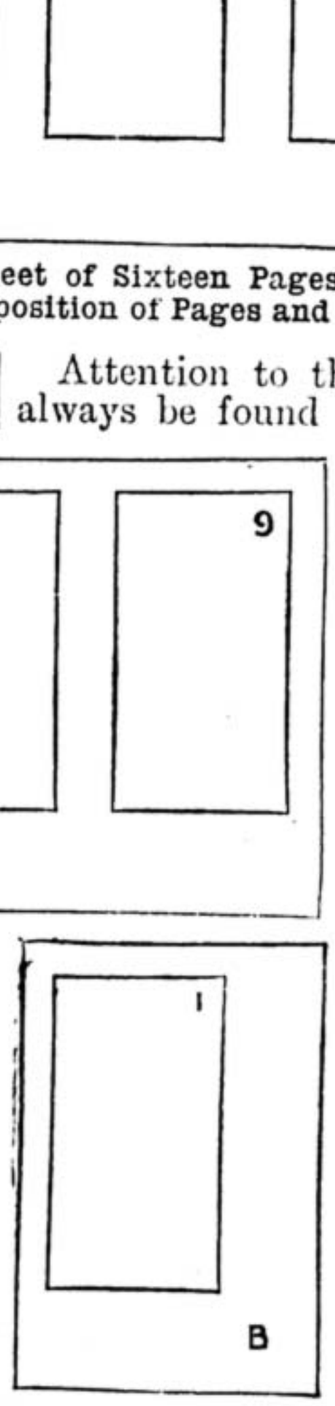

Fig. 6.

Fig. 4.—Sixteen-Page Sheet in Process of Folding: First Fold. Fig. 5.—Ditto: Second Fold. Fig. 6.—Third and Last Fold.

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Nearly all bookbinders' engineers manufacture a folding machine, and some are manufactured with special features to suit certain requirements. A very good machine, which does its work well without any special attention, is manufactured by Messrs. R. Cundall and Sons, Ashley Works, Shipley, near Bradford, Yorkshire. It will do two, three, or four folds. It has a nice tidy delivery, and is easily set from one size to another. Its speed is close on 1,700 per hour, so that, with a very ordinary feeder, it will fold 1,500 sheets per hour.

Mr. James Salmon, of Blackfriars Bridge, Manchester, makes a machine which acts much on the same principle as the one already referred to.

The desideratum in mechanical folders has been reached in the Martini Single and Duplex Folding Machine (Fig. 7). The name of Martini is well known in England in connection with the rifle called the Martini-Henry.

On the Continent his name is still more famous for the invention of the folding machine, and a wonderful machine it is, folding sheets of paper by means of a series of cross metal knives, folding true to register, and delivering in a trough already knocked up.

It seems strange now, when one reflects how many are at work, that binders in this country were so slow in adopting this class of machine. With the tape family of machines there are always a large number of re-folds at the end of the day's work, and when a tape or two breaks in the middle of a large job, I pity the poor foreman, for I know what it means. Both of these evils are entirely obviated by the Martini folders, for there is not an inch of moving tape used to carry the sheet from fold to fold.

How interesting it is to watch one of these machines at work. Two girls are standing, each with a pile of sheets below her hand, at the ends of the machine, feeding them one by one, without the slightest trace of exertion, to the points or gauges. The sheet is immediately carried to the centre of the table, first from one side, then from the other, the knife going up and down away from where the girls are standing, causing the sheet to disappear. It is impossible to keep the eyes fixed on any one sheet passing through the machine, as, being fed so quickly, they come so fast one upon another. Although I am pretty well familiar with the sight now, many a time in the course of a day I discover myself standing gazing open-mouthed like a schoolboy.

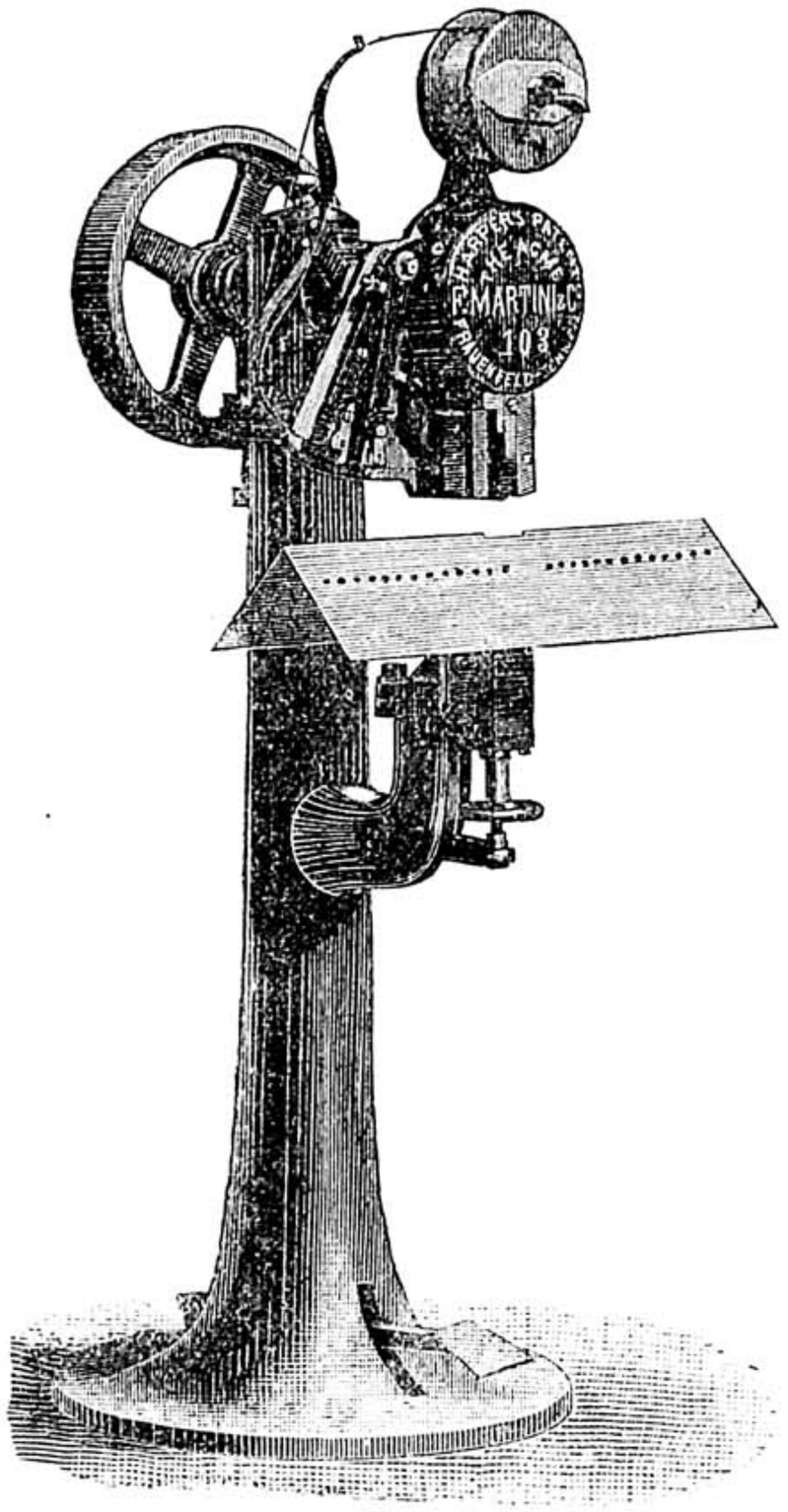

Fig. 8.—Harper's Patent Acme Wire-Stitching Machine.

These folders have for many years folded *Chambers's Journal*, and such fine work as "Hymns, Ancient and Modern," besides doing heavy work like the journal *Engineering*. The Martini machines do their work so well it is no wonder they are so highly esteemed. The London agent is Mr. W. C. Horne, 6, Dowgate Hill, E.C.

There are other machines of a much larger type in use for newspaper work, but these I will pass over, as they hardly come within the scope of our present subject.

Most of the monthly magazines, periodicals, and pamphlets are sent out stitched with wire staples. I never liked wire stitching from the first time I saw it. Of course, it does well enough for pamphlets—in fact, it is all that is wanted for them; but when it comes to magazines—especially magazines of a high-class nature—it is a pity that wire machines were ever invented. Many a time I have been vexed to see that excellent monthly of Harper's torn and mutilated by the frantic efforts of girls in their vain endeavours to get the wires out when preparing them for binding, and this can hardly be avoided, for the wire with which they are stitched is so thick that, unless there is a special appliance in the binding shop for taking out the wires, the sheets are sure to get torn.

I am pleased to see that there is a thread-stitcher in the market now, which will do side-stitching as well as through the back, and as it turns out the work as quick as the wire machines, I hope that those publishers who have not time to sew their magazines

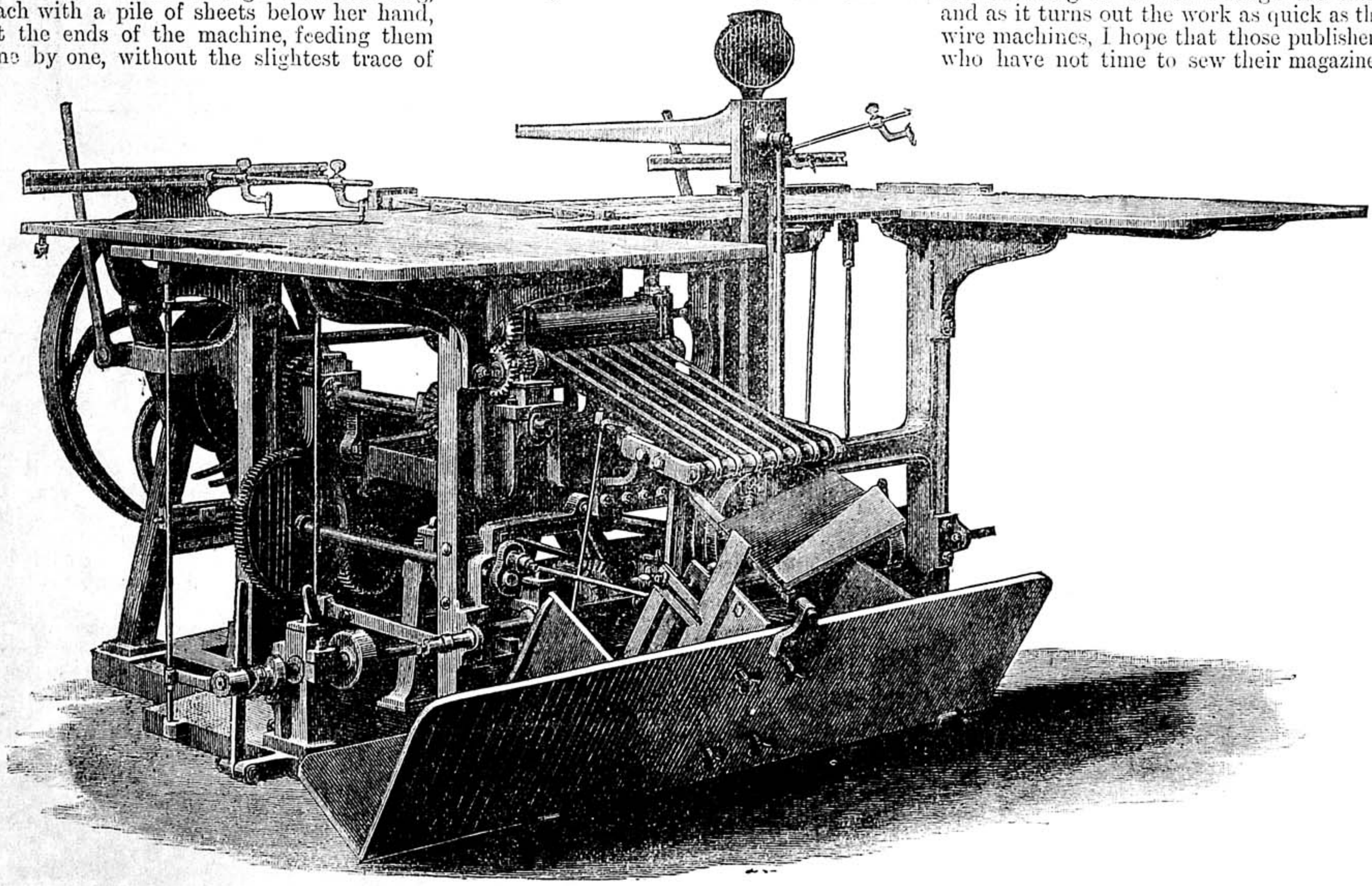

Fig. 7.—Martini Duplex Folding Machine.

will at least stitch them with thread. I had the pleasure of seeing this machine at the Glasgow Exhibition, but as I have not yet had any personal experience with it, I cannot speak of its capabilities. I am sure Mr. W. C. Horne will be pleased to answer any inquiries that may be made regarding it.

But I must say a word in passing about the wire machines, for, now that they are in the binding shop, we must use them.

If I were asked the name of these wire-stitching machines I would answer "Legion," for you can get them in all sizes and shapes, from the puny wee thing that has to be fed with ready-made staples to the high-sounding Patent Automatic Wire-stitching and Binding Machine, that makes its own staple and takes the wire direct from the reel.

Mr. August Brehmer, 33 and 35, Moor Lane, London, E.C., has a long range of these machines, and those sent out by that firm are about as good as any that I have seen. The machine styled No. 6 in Mr. Brehmer's list for treadle-power does its work very efficiently. But it takes a considerable time to change it from one size of stitch to another.

Harper's Patent Acme Wire-stitching Machine (Fig. 8) takes the palm, inasmuch as it will stitch a greater thickness of work with thinner wire than any other machine that I know; and besides, it has only two adjustments, and can be changed from the thinnest pamphlet to work one inch in thickness in a few seconds of time.

The Acme forms, drives, and clinches at the rate of eighty or one hundred stitches per minute.

A CHILD'S WOODEN COT.

BY B. R. CONDER.

THE writer, having made a child's wooden cot, which has successfully stood the test of four years' constant use, purposes endeavouring, in the following paper, to show how any one possessing but a moderate amount of skill in joinery may make a similar one.

The cost of the cot will, of course, depend entirely upon the kind of wood used in its construction; and here there is almost unlimited room for choice. Hard wood, such as oak, ash, or beech, would be best; but almost any wood may be used, provided it be sound and thoroughly dry.

If cheapness is a chief consideration, deal may be used throughout, in which case the whole cost, including stain and varnish, polish or paint, used for decorating, would hardly exceed five shillings. The writer's is of deal, with the exception of the four posts, which are of beech. Much time and many an arm ache may be saved by having the wood chosen sawn into strips of the

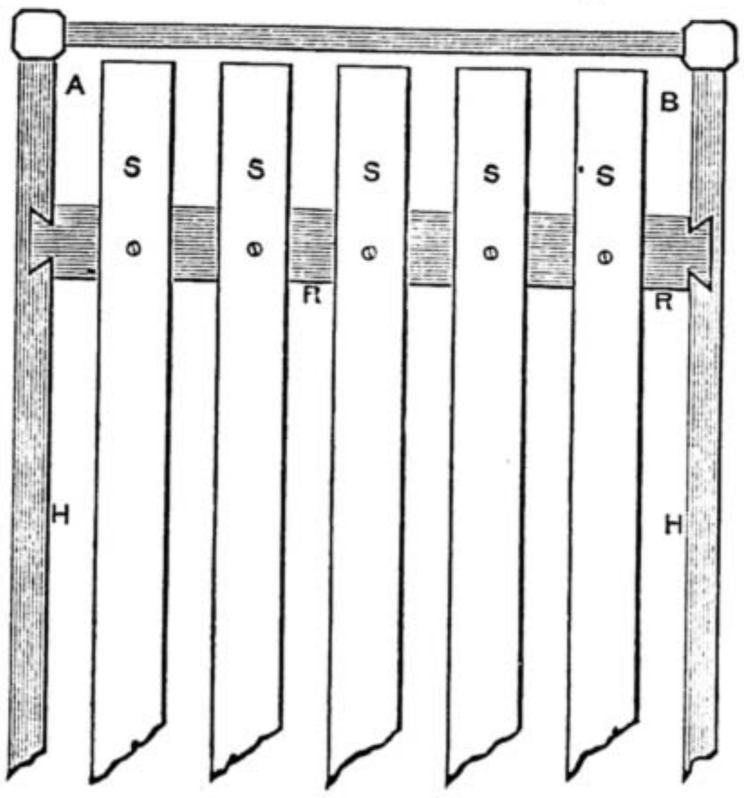

Fig. 3.—Plan in Part, showing Method of fixing Support for Mattress—H H, Bottom Side Rails; R R, Cross Tie; S S, Bearers; A B, Posts.

required widths at the yard; this would add but a very few pence to its cost. The dimensions chosen are: Extreme length, 4 ft. 3 in.; breadth, 2 ft. 3 in.; and height to the top of the posts, 2 ft. 10 in. This is a very usual and convenient size, but it may be varied to meet individual requirements or tastes without altering the method of construction. Now we will set to work.

First cut out and square up the four posts (three of which only are shown in the drawings, as the one lettered B in Fig. 1 is identical with that also lettered B in Fig. 2). These posts should be 1½ in. square and 2 ft. 10 in. long; if castors are to be used, they must be the depth of a castor shorter. It would be well to leave them an inch or so longer at first, and cut them down to their exact length when they are finished in every other respect. The appearance of these posts will be improved if the edges are slightly chamfered and the tops bevelled off, as shown in the drawings; this, however, had better not be done until the various mortises are cut in them. Having squared the posts, next cut out and plane up the rails, D E F, for the ends and G H for the sides. As there are two sides and ends to the cot, all the rails shown in the drawings must be made in duplicate.

These rails are now to be mortised into the posts, and, except in the case of the top ones, the tenon should be carried right through the post, and when glued up wedged from the outer side. This greatly strengthens the joint, and though rather unsightly in a prominent position, is not here conspicuous enough to be noticeable.

Now carefully mark with the mortise gauge, and cut the tenons at the ends of each rail and corresponding mortises in the posts. The respective heights of the tops of these rails from the floor are as follows:—D and G, 2 ft. 9 in.; E, 1 ft. 8 in.; F, 10 in.; and H, 1 ft. 3½ in. Having made these joints, fit rails and posts together, and test all angles with the square, taking great care to ensure having the posts perpendicular and the rails at exact right angles with them.

Next prepare the uprights, K and L (Fig. 2), and mortise them ¾ in. into G and H at a distance of 4⅛ in. from the posts, B and C, respectively; then the rail, M, which is in turn mortised into K and L on the same level as E in Fig. 1. All these pieces, with the exception of H, should be 1¼ in. deep, and cut out of 1 in. stuff, which will leave them when cleaned up ¾ in. thick, or a trifle over. As H has to support the weight of the bed and occupant it must be stouter—1¾ in. deep and 1¼ in. thick. Now fit all the parts so far prepared together, and test the work with the square as before described. This should be done from time to time as the cot grows, as it is a very necessary operation, and, indeed, one which can hardly be too frequently repeated. Having done this, and rectified any mistakes discovered in so doing, prepare out of ¾ in. stuff the small uprights that connect the top and middle rails of sides and ends; they should be ¾ in. wide, and 1 in. longer than the distance between D and E and G and M, as they are to be mortised ½ in. into these rails. Great care is necessary to space them evenly and keep them perpendicular. The arris or sharp edge should be removed with the plane from all the rails higher than H, for the sake of the tender hands of the intended occupants of the cot. The various parts of the sides and ends are now complete, but before joining them finally together, we must provide a support for the bed. For this purpose, two pieces of wood, 2½ in. wide and

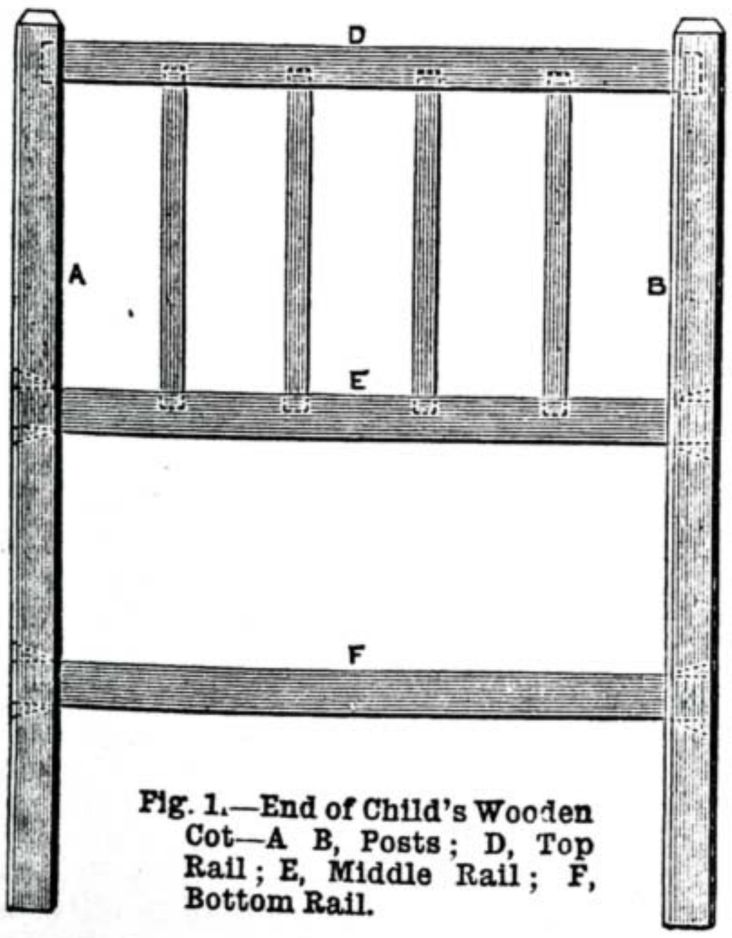

Fig. 1.—End of Child's Wooden Cot—A B, Posts; D, Top Rail; E, Middle Rail; F, Bottom Rail.

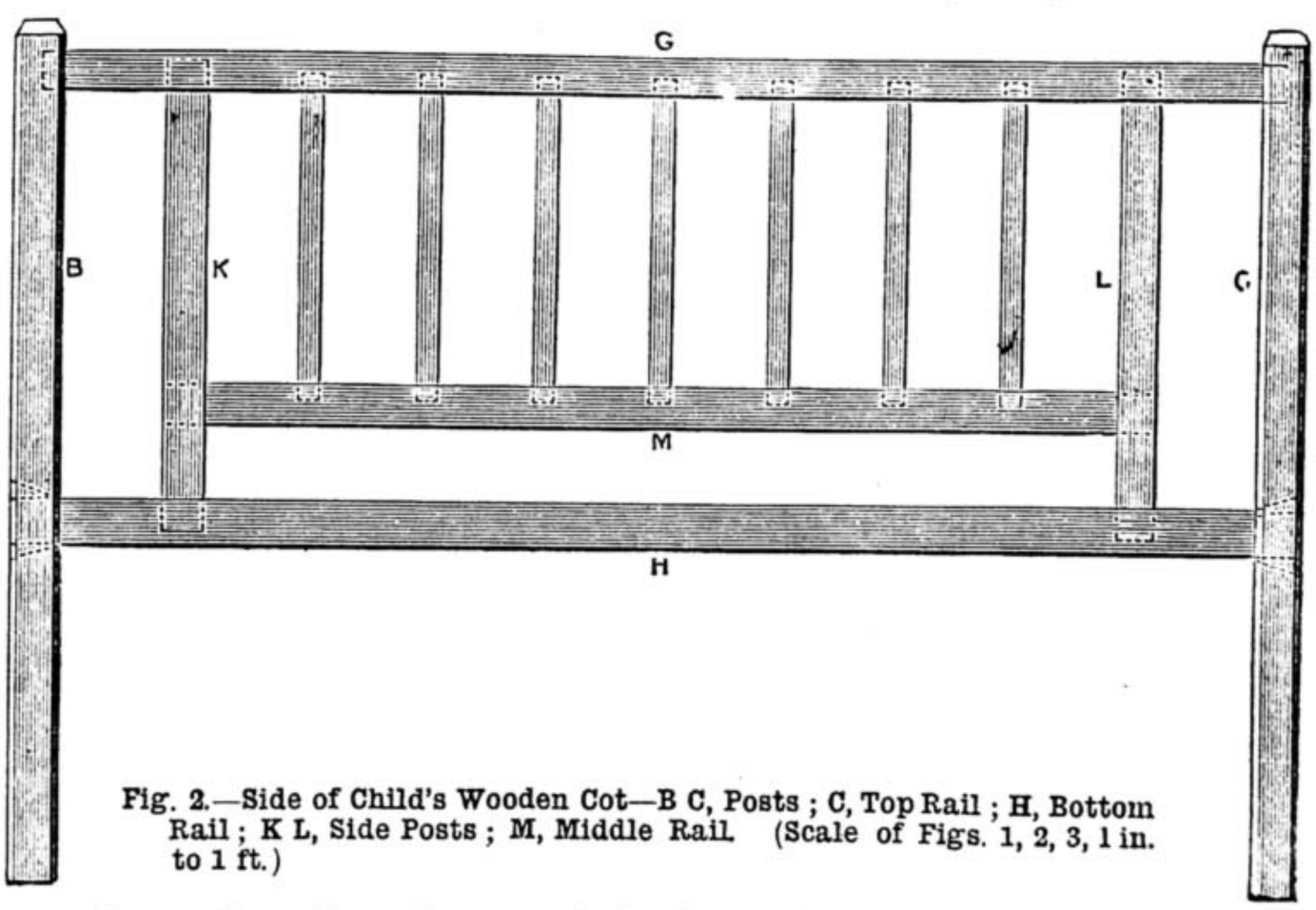

Fig. 2.—Side of Child's Wooden Cot—B C, Posts; C, Top Rail; H, Bottom Rail; K L, Side Posts; M, Middle Rail. (Scale of Figs. 1, 2, 3, 1 in. to 1 ft.)

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¾ in. thick, are notched, as shown in Fig. 3 (R), into the rails, H: one 7 in. from the head, the other the same distance from the foot, of the cot, and sunk sufficiently to bring the surfaces of the narrow strips, S, when placed across them, exactly on a level with the top of H. These strips, five in number, which act as bearers, must now be got ready. They should be ½ in. thick, 2½ in. wide, and 3 in. shorter than the extreme length of the cot. They are to be placed 2 in. apart on the cross ties, R, parallel with the rails, H, and screwed down to R, after the framework is glued together. Do not use thicker than ½ in. wood for these bearers, as that is ample for strength, and gives a certain amount of spring. We have now to join these various parts of the cot firmly together. This is a somewhat delicate operation; and on the care bestowed upon it depends, in great measure, the strength and appearance of the cot. During its progress, every angle should be tested with the all-important square. It will be best first to frame the ends, which will give us two separate parts like Fig. 1; next the rails and uprights of the sides, which will give us two separate parts, like Fig. 2, without the posts, B and C; then ends and sides together, and wedge up where necessary. The wedges are indicated by dotted lines in Figs. 1 and 2. Finally glue in their places the cross pieces, R, and when the glue is set, screw the narrow bearers, S, to them.

The cot, as far as its construction is concerned, is now finished. Some of the details might, doubtless, be varied with advantage; that is a matter for individual taste. The posts and rails might be turned, or, again, the small uprights might be rather differently arranged, or dispensed with altogether by those who object to the labour of cutting so many small tenons and mortises, and panels substituted. If this latter plan is adopted, care should be taken to avoid imparting to the cot too much the appearance of a box on legs.

If, however, the directions set down are followed, the worker will be well repaid for his labour, by becoming the possessor of a strong, useful, and not altogether unornamental piece of furniture at a very trifling cost.

CIRCULAR SAWS: THEIR ADJUSTMENT AND MANAGEMENT.

BY M. POWIS BALE, M.I.M.E., A.M.I.C.E.
Author of "Wood-working Machinery," "Stone-working Machinery," "Saw-mills," etc.

As good saws cannot run properly in a bad machine, it may be as well to consider briefly, in the first place, what points of construction are to be desired in a really efficient saw bench. In the most advanced practice the main frame is invariably made on the "box" system, and cast in one piece, and there is little doubt that the strains and vibrations of working are thus more readily absorbed than is the case where the frame is put together in sections. The face and edges of the table must be truly planed.

We now come to a very important matter in all wood-working machines, viz., the bearings; and we cannot help thinking that, having in mind the constant and severe strains to which they are subjected, the majority of them in this country are made much too short: the bearing surface is thus limited, and consequently the pressure on it is very great. In America long bearings have been the rule for years, and some few English firms are at length introducing the system, with the result that, owing to the pressure being distributed, the friction and consequent heating and wear are reduced and their longevity largely increased.

In preference to white metal alloys as used in the States, gun-metal and phosphor-bronze are the materials usually employed here, and a bearing of from three to four diameters in length can be recommended. For all saws above 30 in. in diameter, three sets of bearings should be fitted, one of these being placed outside the driving pulleys to overcome the pull of the belt. The author recommended that this latter bearing be made adjustable for wear; this can readily be done by dividing the bearing vertically and unevenly, and by passing set screws through the side of the pedestal. In large benches, at any rate, it will be found convenient to let the bearings in from the top of the bench and fit in false plates in preference to fitting them in plummer blocks bolted to the under surface of the frame. To ensure the saw spindle running true, all bearings should be bored out in their places instead of in a lathe, as is occasionally done. The saw spindle should be of steel and free from seams or hard places, and fitted with an adjustable lock-nut to take up the end wear. The saw collars and steady pin should be very carefully made, and the latter be an easy fit, or it may throw the saw slightly out of centre. The hole in which the pin is fitted should be countersunk. The fence should be very accurately planed, arranged to bevel, and fitted with strips and fine adjustment screw for accurately gauging the thickness of the cut. In heavy machines, a lever pressure roller and weight for holding the wood up to the fence will be necessary; and the drag-rope, roller, chain, rack, or other feed for taking the wood through the saw is usually fitted. We take it a very important factor in the effective working of circular saw benches is found in the diameter and width of the driving pulleys employed. Many of these are undoubtedly made of too small a diameter and too narrow on the face for the work they have to perform; on this point we shall have something to say further on. These pulleys should be crowned on the face, and the pulley driving them flat, and of a width equal to both of them. With reference to the loose pulleys on saw benches, there is little doubt that they are amongst the most troublesome things in a saw-mill to keep in order, and it may not be out of place to say a few words thereon. In the first place, they are not always properly designed for the work they have to perform, the same pattern being used for all kinds of duty.

For use on saw benches, where the speeds are high and the belts often heavy, the pulleys should, in all cases, be bored and rhymered perfectly true. If an ordinary loose pulley be used, the boss should be extended so as to project, say, an inch beyond the rim of the pulley; the inside of the boss should be recessed and an oilway cut. The pulley should fit the shaft easily but not loosely, so as to admit of a thin film of oil penetrating between the pulley and the shaft, the object being for the pulley to ride on the oil and not on the shaft. For use in saw benches, the loose pulley can, with advantage, be made of less diameter than the fast, so that the driving belt is relieved from strain when not at work, and has time to recover its elasticity; it is usual in this case to make the loose pulley with an inclined flange leading up to the fast pulley to facilitate the shafting of the belt.* The oil-holes should in all cases be of ample size, and either a lubricator or pipe fitted. The lubrication should be carefully attended to, especially when the pulley is new; should it once be allowed to seize, it will require re-rhymering, or it will be constantly giving trouble. If properly fitted and lubricated, cast iron makes an excellent wearing surface; a little fine lumbago introduced into the oil will keep it longer in the bearing, and by filling up the little pores in the iron, produce a fine, smooth surface. Should the loose pulley be made of less diameter than the tight, the difference should not be great, say not more than 1 in., or, in shifting the belt from the loose on to the tight, it will become unevenly stretched on the one side, and be apt to run out of truth. In many cases, it will be found an excellent plan to arrange the loose pulley to run on a sleeve of cast iron. A patent in this direction has been taken out (Davis's Patent), of which we hear satisfactory results. In this plan, the boss of the loose pulley is somewhat enlarged, and made to revolve on a sleeve instead of on the shaft itself. The pulley boss is recessed to form an oil chamber, and the oil is supplied in the usual way through a pipe, and is prevented from leaving the bearing by means of a flange fitted to the end of the boss, and by the centrifugal force engendered when the pulley is set in motion, which causes the oil to fly immediately to the largest diameter, which is the working or rubbing face of the sleeve. Tight belts, often too narrow for the work, are a fruitful cause of loose pulleys grinding on the shaft and getting out of order. The author has recently patented a system of bushing loose pulleys with glass which has every appearance of being highly successful. In this case the bush is crenated in such a manner that a supply of lubricating material—of which very little is required—is retained in it.

Circular saws may run out of truth from a great variety of causes, amongst which the following are perhaps the chief, but practical operators will be able to add to the list:—

(1) Saws of too thin a gauge for the work.
(2) Irregular setting.
(3) Improper form of teeth for the work.
(4) Too rapid a feed of the timber.
(5) Improper sharpening of the teeth.
(6) Teeth of an improper pitch, or with insufficient gullet space to allow sawdust to escape freely.
(7) Saw plate unevenly "balanced," or improperly hung.

(1) The thinness of the gauge at which a saw may be safely run depends in a large measure on the nature of the wood being cut and the skill of the operator in selecting the right shaped tooth, sharpening and "packing" the saw properly, and keeping it in what may be termed scientific order. In America thick gauge "distorted" saws, run with guide pegs but without packing, have been the fashion, but, as this means loss of power and wood, they will, as wood becomes dearer, doubtless give way in favour of thinner ones. In selecting a saw, what is required is one of a gauge not so thick as to waste unnecessarily power or wood, or so thin as to give constant trouble to keep in order. It must also be borne in mind that the thinner the gauge of the saw, the more teeth will be required to allow of the same amount of feed; the power required will, however, be increased in ratio. A thick saw can be run at a higher speed than a thin one, as it expands less rapidly from the centrifugal force set up, and is less likely to become "rim" or "centre" bound.

* "Saw-mills: Their Arrangement and Management," by M. Powis Bale.

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(2) Irregular setting is a frightful cause of saws running from the line and turning out bad work. Setting by rule of thumb is a stupid and wasteful plan; in all cases a gauge should be used, whether spring, hammer, or spread setting be employed. In working, it is found that the teeth of a saw wear at the side of the points, and if some teeth have more set than others, these are strained unduly, and rapidly worn away, and from the severe and uneven friction are often heated, and are inclined to buckle and run from the line. The operator must exercise his judgment as to the amount of set required to suit different kinds or conditions of wood, as it is both useless and wasteful to give a saw more set than is absolutely necessary. Care must be taken that both sides of the saw are set alike; should one be set more than the other the teeth will, of course, lead or run from the line.

(3) If teeth of an improper form or unsuited to the nature of the wood being cut are used, we need hardly say that a great amount of friction is set up; in some cases the teeth are broken, and the result is in every way unsatisfactory. Teeth of almost any shape and in any condition can be driven through the wood by sheer force, but this is mangling, not sawing. What is required are teeth of the correct shape for the nature of the wood sawn, and equal in pitch, space, bevel, gullet, length, and set. This list may appear a long one, but users will find that any reasonable amount of time spent in keeping saws in fine condition, and working them in a scientific manner, is a very paying investment, the result being more work, of better quality, less wear and tear and expenditure of power. The question of the shape and cutting action of saw teeth is a scientific matter of much importance to timber converters, but as it would require many drawings and much space to discuss the subject fully, it is beyond the scope of the present paper; the author would, however, refer those interested to the following books.* We may say, speaking generally, that for cutting soft wood the angles of the teeth should be more or less acute, according to its softness, and those for medium and hard wood more obtuse in ratio to the varying densities of the wood. It may be some little guide to know that when a saw is cutting sweetly it should produce extremely minute chips like those from a mortise chisel, and not very fine sawdust; if the latter is made the saw is scraping, not cutting. Whatever teeth are selected, should they spring or tremble in work, it may safely be concluded that they are unsuited to the work in some way, possibly either too long or too hooked, or of too thin a gauge.

(4) Too rapid a feed of the timber is a matter that can only be judged by the sawyer, and depends entirely on the nature and condition of the wood being cut, the kind of feed gear, and the condition of the saw. Of course no one would attempt to feed hard, frozen, or difficult wood much more than half as fast as soft, and some woods, such as cocus, rosewood, etc., at less than this. If the feed is too fast, the timber will often rise up the back of the saw, and in some cases the sawyer will get a gentle reminder by having it thrown at him, or the saw will become jammed and buckled, or the driving belt thrown off. "Swagged" or spread set teeth will stand a quicker feed than spring set.

(5) An immense variety of opinions exist as to what is the proper way to sharpen a saw, almost every operator having ideas of his own, good, bad, and indifferent, chiefly the last two; consequently we find an immense quantity of badly and improperly sharpened saws. We ourselves thoroughly believe in sharpening with a machine with which there is no difficulty in getting each tooth of the saw alike in their cutting angle, pitch, and depth of gullet. The great point to aim at, whether emery wheels or files are used, is to sharpen each tooth so that it will take its allotted share of work; to effect this, the cutting angles of the teeth must, together with the set, be exactly uniform. It is impossible, however, to properly describe the operation of sharpening in writing without an elaborate system of drawings. To keep all the teeth uniform the author can strongly recommend the use of sheet steel standard templates of several teeth; by mounting these in a light, adjustable, radial arm, fixed on the sharpening stud, and made to bear flat against the saw plate at the periphery, the exact shape and depth of the teeth can be obtained from the template by traversing the saw round by hand.

(6) A fruitful cause of saws buckling and running from the line is the insufficiency of throat space in the teeth; consequently the sawdust cannot escape fast enough, and becomes clogged. The teeth should also be all of equal length; if not, the longest teeth get the most work, and the cutting power of the saw much lessened. The length of the teeth should be regulated by the nature of the wood being sawn; for instance, for sawing sappy or fibrous woods, long, sharp teeth are necessary, but these must not be too long or they spring, and perhaps break in work. The author is of opinion that many of the saws in use in Europe carry too many teeth, and he is in favour of the American system of using fewer teeth—if not carried to excess—as more throat space is given to the clearance of the sawdust, and less power is required to drive. The throat space of saw teeth should be varied according to the depth of the wood being cut, as it will be seen at a glance that teeth with a sufficient throat space to allow sawdust to escape freely in sawing 18 in. deep would probably become jammed in sawing double that depth.

For gulleting, an emery wheel is much to be preferred to a fly press; the latter is wasteful and apt to spring the plate when punching out deep gullets. If a saw is kept in good order, and the teeth are not allowed to get short and stumpy, very little gulleting should be required at one time; in fact, the gulleting press should be conspicuous for its absence, and only be used for retoothing broken saws.

(7) In hanging a saw care should be taken that it does not fit too tightly on the saw spindle or bind the steady pin. A saw, when properly hung, should, in the horizontal line, incline very slightly towards the timber, so that the teeth at the back of the saw may rise without scoring the wood. The saw should be perfectly in balance, that is, *perfectly round;* if it has teeth of unequal length, size, or shape, it is not properly or scientifically balanced.

There are other reasons—no fewer, indeed, than fourteen—why circular saws sometimes run out of truth, but we will deal with these in another paper, giving, as we have done above, first the causes, and then dealing with the means that should be taken to prevent their occurrence, as we judge it to be best for our readers not to separate one from the other.

* "Worssam on Saws," "Grimshaw on Saws," "M. Powis Bale on Saw-mills."

VERTICAL SUN-DIALS.

BY ARTHUR YORKE.

East and West Dials.

PRINCIPLE OF EAST AND WEST VERTICAL DIALS—SETTING OUT THESE DIALS—MATERIALS AND METHODS OF CONSTRUCTION FOR VERTICAL DIALS—ORNAMENTATION—MOTTOES—A SUGGESTIVE SPANISH DIAL.

IN the *east and west vertical dials*, although the face of the dial will still represent a plane at right angles to the plane of the horizon, that plane will also be at right angles to the planes in which are the faces of the south and north dials. Hence it must follow that though the stile will still be parallel with the axis of the earth, it will also be parallel with the plane of the dial, and that the gnomon, instead of being, as in previous cases, a triangle, must be a parallelogram. It is hard to explain this by a mere diagram; to make it clear a model is required. If, however, the reader will refer to Fig. 1 (page 105, Vol. II.), where he will remember that the line, *e f*, represents the plane of the vertical south dial, *seen edgewise*, and will imagine that plane turned at right angles to its present position so as to present its full front, he will see that it will become a plane identical with or parallel to the plane in which is the line, A B, which is parallel with the axis of the earth. The stile in these dials has therefore to be parallel to the plane of the dial.

As time-keepers, east and west dials are far from having an equal value to the horizontal or south vertical dial. They are indeed more useful than the north dial, which notes time for some four or five hours in the height of summer only; but their period of service extends only from sunrise to noon, and from noon to sunset respectively. The two are required to accomplish the work done by the horizontal dial alone. Another shortcoming in these dials is their want of symmetry, owing to which it is not easy to make decorative features of them. It is indeed necessary that they should be explained in this place, yet we imagine that few will care to construct them, except it be for the arrangement known as "combination dials"—an arrangement which has been in favour in most of those ages in which dialling has been practised. In the combination dial a cube of material, commonly stone, is mounted on a pedestal, and so fixed as to be level and facing the four cardinal points; its top can thus be made into a horizontal dial, and its four sides into north, south, east, and west vertical dials respectively.

To set out an *east vertical dial* we have first (as in Fig. 4) to draw a horizontal line at A B, and from this, say at C, to set off a line which shall with A C make an angle equal to the complement of the latitude of the place for which the dial is intended. This place we will, as before, suppose to be in the same latitude as Edinburgh (56°). The angle, A C D, will therefore be one of 34°. Then, at any convenient point on D C, as at *e*, and with any convenient radius, as *e f*, we describe a circle, and draw the lines, *g h* and *i k*, touching the circle, and parallel to D C. Through the centre, *e*, we now draw a line, *f l*, cutting D C at right angles. This will be our 6 o'clock line. By the lines drawn, the circle is now divided into four quadrants, and the two of these which lie nearest to C we proceed to divide each into six equal parts. Through these divisions we draw lines from *e* till they cut the lines, *g h* and *i k*, and the points thus gained will, when united by

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lines parallel to *f l*, give the hour lines, VII., VIII., IX., X., XI. Continuations of the lines giving the points for VII. and VIII. being carried through *e*, will also give points for the hour lines, V. and IIII.

The *west vertical dial* is the mere counterpart of this, and to construct it we have only to trace and reverse the plan given in Fig. 4.

In Fig. 5 is shown the proper gnomon for the plan Fig. 4. It is so pierced as to be made somewhat ornamental. When in place, it will stand with its substile stretching along the 6 o'clock line, which (in Fig. 5) is represented by the line, Y Z. The width or projection of the gnomon must be equal to the radius of the circle in the plan, and its length as much greater than the diameter of that circle as the arrangement of the numerals which denote the hours may render desirable. This gnomon will alike serve for an east or west dial. In arranging the actual dial, due allowance must of course be made for the thickness of the gnomon.

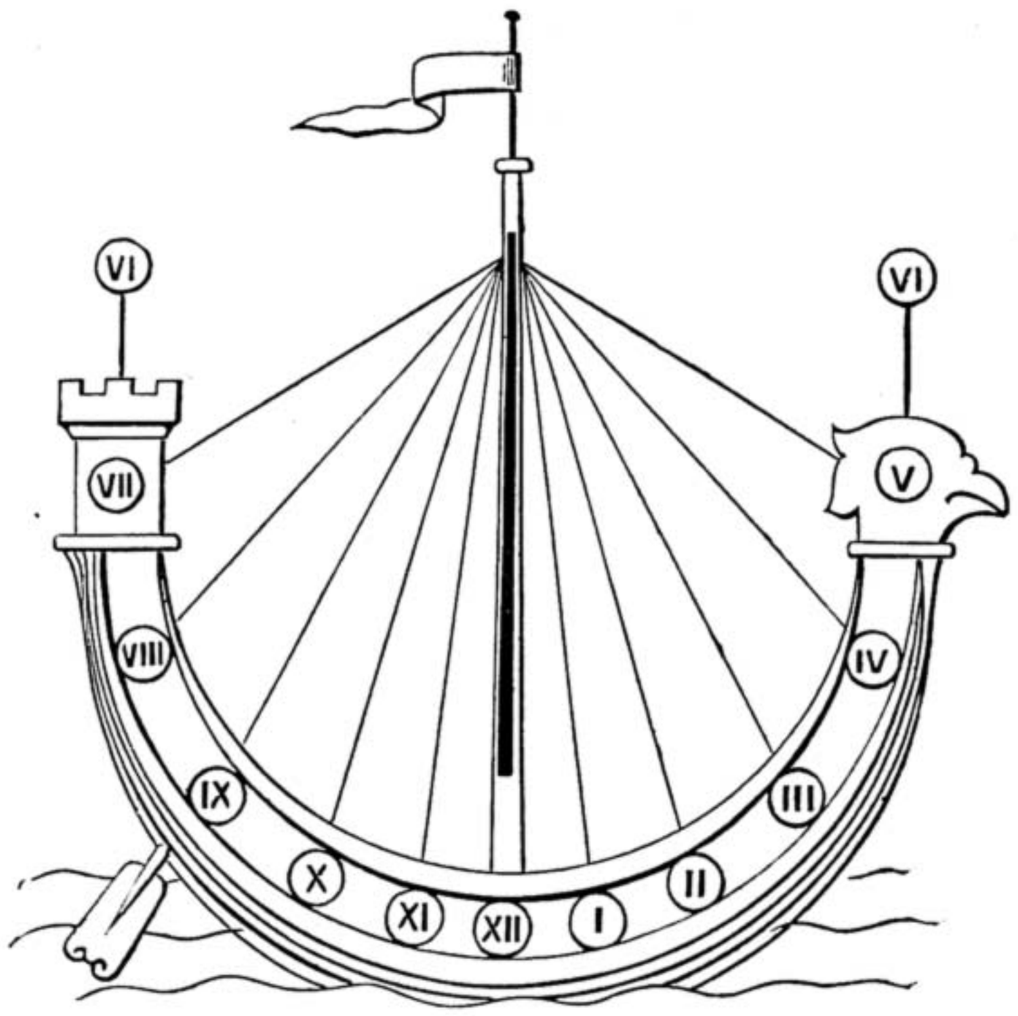

Fig. 6.—Suggestive Treatment of a Vertical South Dial at Tortosa, in Spain.

To the non-professional diallist the vertical dial offers an easier and more tempting field of labour than the horizontal, and for reasons already given it will most commonly be the south dial that he will elect to construct. Against a stone building, perhaps the most suitable dial will be one shaped from a slab of freestone, and having the lines, numerals, etc., incised and blacked. A vertical dial will not suffer in this material as would a horizontal one, for to a great extent it can be readily sheltered by the eaves or otherwise, and if wetted will readily dry again. With an occasional retouching of the black paint it will endure for ages. Slate may be provided more cheaply and worked with less skill in the art of the stone-cutter, but left in its natural colour will be less legible at a distance. A slab of slate may, however, very well be painted with some damp-resisting paint, and so be made to show up more plainly; it would last for a reasonable length of time. Zinc is not good for a dial, partly from its tendency to warp in the sun, partly because paint does not stand well upon it; and if wood be used, it should, to avoid warping, be in a thick slab. It may then stand for a lifetime. On the writer's own premises is a dial painted on a slab of oak, bearing date 1834, which is still perfectly sound and serviceable.

Or at no further cost than a little trouble, the dial may merely be painted on the wall of the building—provided the aspect exactly faces a cardinal point; and as in this case the diallist will be less cramped for space, he may indulge more liberally in ornament. Any wall which is fairly smooth may be made fit for painting or gilding upon by coating it with gutta-percha dissolved in naphtha, a little shellac dissolved in the same being added. This preparation will stop absorption and resist damp. It is as yet a thing little known, having been till a few years since a trade secret in possession of a single firm of country decorators. A certain amount of shelter might always be provided for such a dial painted as described. In vertical dials, moreover, the necessity for going to the expense of a metal gnomon is less urgent. A slate gnomon, which any one can cut for himself, and of which the material costs virtually nothing, may be considered safe at the height at which a vertical dial is likely to be fixed; and it will have the advantage of never getting bent.

Fig. 5.—Gnomon for East Vertical Dial.

The decorator of dials has before him an admirable and a boundless field in which to exercise his invention. The sun-dial has in all ages been looked upon as a fit subject for the display of fancy. A favourite form of what may be called intellectual decoration has ever been the use of mottoes. These, like Touchstone, as described by the melancholy Jacques, commonly "moral on the time," and owing to the greater terseness and epigrammatic power of that language, they most frequently moralise in Latin. Something of a rhyme or of a pun is often attempted. "*Orimur, morimur*"—we are born, we die—says one Warwickshire sun-dial, the truth being equally applicable to the fleeting shadows on the dial and to those who watch them. In "*Transit hora sine mora*," another in the same county reminds us how time and tide wait for no man; whilst in the adjacent county of Gloucester is a dial which with "*Lex dei lux diei*," proclaims that the (moral) light of the world is the law of God. Indeed, there would be little difficulty in quoting a long list of such mottoes.

As an illustration of fancy applied to the dial itself we may instance Fig. 6. From ancient times the ship has been regarded as an emblem of the course of time. This is a south vertical dial, and the diallist has here taken the form of the antique galley, and so conventionalised it as to adapt it to his requirements. The holes for oars have served as spaces for his numerals; for his hour-lines he has utilised the cordage; the mast is his meridian; and the projecting gnomon would to some extent carry out the idea of a sail.

This dial is from the front of a house in the ancient city of Tortosa, Spain, where it gave the writer some small amount of amusement in sketching it whilst detained by the washing away of a railway bridge. Spain is the land of sun-dials. From the frequency with which they meet the eye whilst traversing their country one might infer that the Spaniards had a high idea of the value of time. The world does not credit them with this; if, however, they love industry as little and procrastination as much as is generally supposed, it is not because they have nothing to remind them of the flight of the hours.

This design might well be used and perhaps improved upon by English diallists. A friend of the writer's suggests that the idea contained in it might be more fully carried out (by a diallist who knows how to paint) by placing the figure of Time on the rostrum of the boat and one of the Recording Angel in the poop; with the appropriate motto—borrowed, let me say, from a dial at Gloucester Cathedral—"*Pereunt et imputantur*."

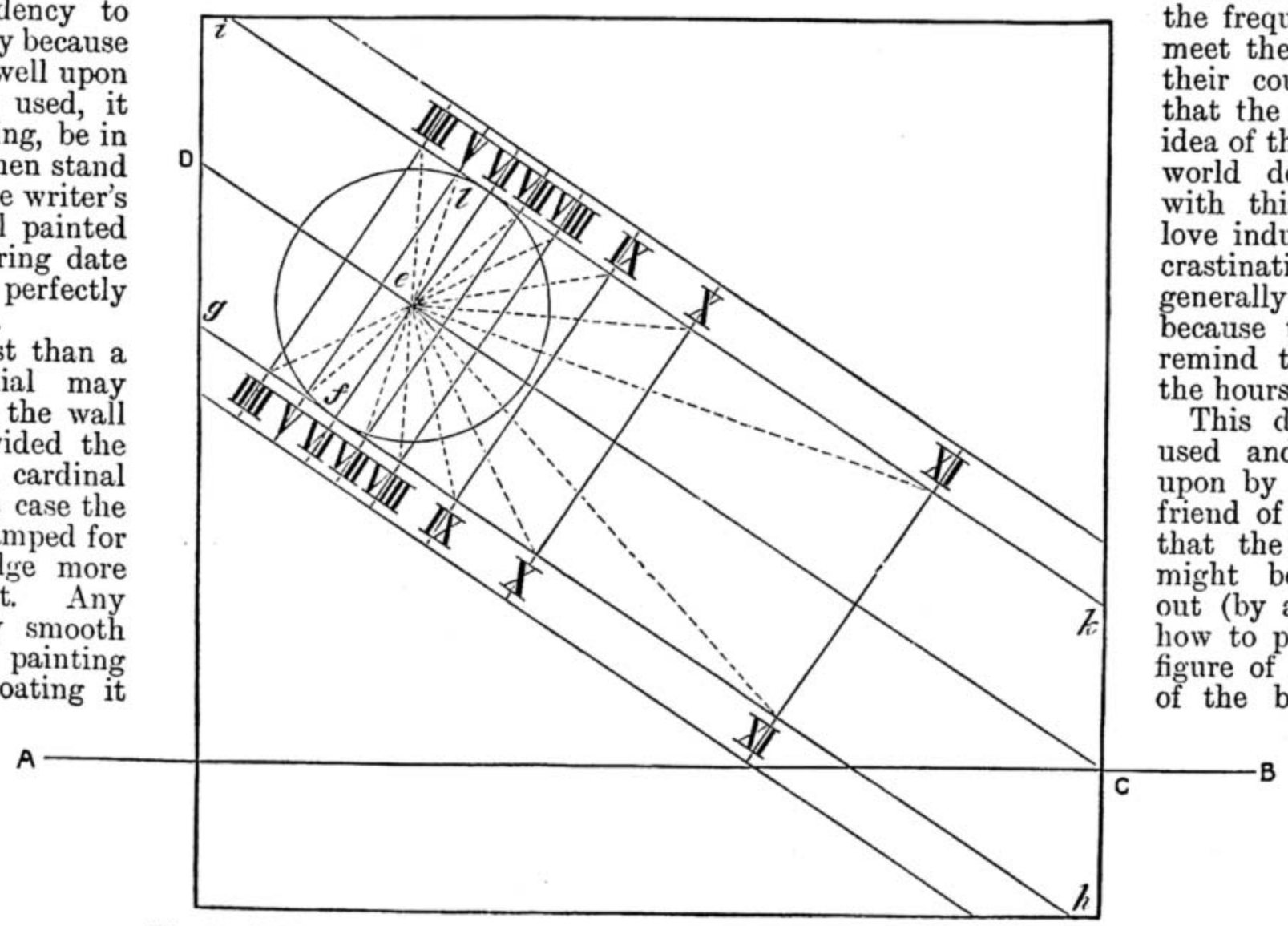

Fig. 4.—Setting Out an East Vertical Dial. (For the Latitude of Edinburgh.)

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Photo Mount. (A piece of fancy work for engravers on soft metal.) *(Portrait from a Photograph by W. & D. Downey.)*

A NOVEL AND ARTISTIC PHOTO MOUNT.

BY NORMAN MACLEAN.

In accordance with my promise, I now give the details of a novel idea, applicable to photographic and small picture-frame mounts generally. I commence by giving a list of materials, to be followed by the mode of preparing the metal for engraving. My readers may gain some idea of the effect from the accompanying sketch. An engraved plate of the size given is intended for a carte-de-visite.

List of materials for photo mount :—

Mahogany board, 12 in. by 12 in. by 1 in., planed smooth ; sheet of Britannia metal, 9 in. by 7½ in., 12 gauge ; one tin of Aspinall's blue enamel paint; camel-hair brush or badger-hair brush; one dozen full size carpet pins.*

The mahogany board may be supplied

* The carpet pins may be obtained at an upholsterer's.

by any cabinet-maker, and the enamel and brush by a dealer in artist's materials, etc. For a list of tools required by the engraver, see No. 33 of WORK. The second article (the sheet of Britannia metal), being the most important, requires a paragraph to itself.

While all other metals can be bought at the respective dealers, I do not know a single place where Britannia metal can be purchased; the principal reason for this being that users of the metal mix and cast into ingots for themselves only, and send to the mill to be rolled to such a gauge as will best suit their own particular requirements. Britannia metal* is usually composed of pure tin ninety parts, copper two parts, and regulus of antimony eight parts, the tin being first melted, the copper and regulus being added to the tin while in a melted state, carefully skimming the dross from the surface, after which it is poured into a mould 9 in. by 6 in. by 1 in., and allowed to set, when it is sent to the rolling mill to be rolled to such a gauge as may be required. Those of my readers who are unable to obtain for themselves sheet Britannia metal are respectfully referred to the advertisement column for my address in No. 52 of WORK. Now for the photo mount: take the mahogany board, and place the metal on the top, and with a moderately hot laundress's iron carefully flatten the sheet of metal by rubbing the iron forwards and backwards, taking care not to let the iron remain in one place too long, or the metal will melt, and consequently spoil the sheet. This being done, wait until the sheet of metal is cold, and handle carefully. Now take some turpentine and clean rag, and clean both sides of the sheet to remove grease, and stand before the fire to remove odour.

The sheet of metal is now ready for the enamel, of which I generally give two coats, allowing the first to dry before applying the second, and having handy a cardboard box with lid to it, into which I place the sheet immediately after the enamel is laid on, to preserve the surface from dust, and as a further precaution I put the cardboard box in a drawer. The painting of the sheet requires no special training, merely a little care in the laying on of the enamel, and smoothing off always in the same direction. When the first coat is completed, wash out the brush in turpentine, and dry, and it will then be ready to use when again required. Leave the sheet to set for a day or two, after having given the second coat of enamel.

To fix the sheet to the mahogany board, bore four small holes, one at each extreme corner, and insert the carpet pins; this will be sufficient fastening as regards the sheet itself. But we must not forget that we require a piece cut out to receive the photograph. This may be cut out of the centre of the sheet or out of the right-hand bottom corner, and may be circular, elliptic, or square, or in the form of a parallelogram. I think, however, we may at once dismiss the square outline as being too ungraceful. There remains the choice of the other three, of which the oval and oblong are far the best.

Suppose the engraver has decided upon the oval outline for the photo: he will find it necessary to fix the part to be cut out with four more carpet pins. Before doing this, the sheet should be properly divided by faint pencil lines lengthways and across. Those lines will give the exact centre of the sheet.

* The mixture composing Britannia metal varies according to the user's requirements.

Now, as the oval outline is rather difficult to cut by hand, we must have a true oval for a guide, or else we shall never succeed.

The best plan is to cut the oval out by means of the oval chuck in a lathe, and as a matter of fact, the specimen is so done, and is further enriched with ornamental drilling in the lathe. As but few amateurs possess an 8 in. centre lathe, which would be required to "take" a board 12 in. square, I must refer them to any of the well-known processes for obtaining an oval by means of the elliptic compass: the ellipsograph lately described in Messrs. Cassell's "Family Magazine," or by means of two pins fixed on the line of the longer axis of the ellipse, aided by a loop of cotton and a finely-pointed pencil. By these latter means we are enabled to strike a comparatively true oval of any size and shape, either sharp or blunt, the distance between the two pins providing for the sharpness or bluntness of the oval. Having got the outline of the oval marked on the sheet, we now take a wide-faced graver, and cut the oval in a single cut and an equal depth, using for this purpose a freshly-wetted graver, and polishing on a piece of sea-horse hide, on which some jeweller's rouge has been well rubbed in. This will cause the graver (if properly sharpened) to cut with dazzling brightness. Now go over the outline of the oval, gradually cutting with the right-hand facet of the graver (to produce the bevel) until the oval is completely cut through. A little care will make a neat job of this.

Now that we have got the oval cut out, all the rest of the work is comparatively easy. It will be necessary, however, to decide upon the style of ornament, which may be in almost any style; but my liking is for floral design in this case, and in my opinion cannot be improved upon.

Sketch in with a "BB" lead pencil the design decided upon, using caution, not bearing too heavily on the pencil. Then outline, improving on the pencil sketch as you proceed, not forgetting to brighten the graver on the rouge buff. The outline of the subject being done, fit the sheet of metal into its frame and study it from a short distance (as from its destined position on the wall), and suggest your own improvements.

The flowers themselves must not be entirely shaded away, but must have a little relief, as shown in my specimen; but the leaves, stalks, buds, and branches must be cut away bright, using for the purpose a fine shading graver, afterwards veining the leaves to produce a given effect at a little distance from the observer. To those of our readers who would wish to present their own photo with the mount and frame, I may suggest an autograph signature by way of a finish.

If this is decided upon, it should find a place in the right-hand bottom corner of the mount. To do this, write in your usual handwriting "Yours truly," followed by the name, with the "BB" pencil, and cut with a lozenge-graver, giving as nearly as possible a fac-simile of your usual signature.

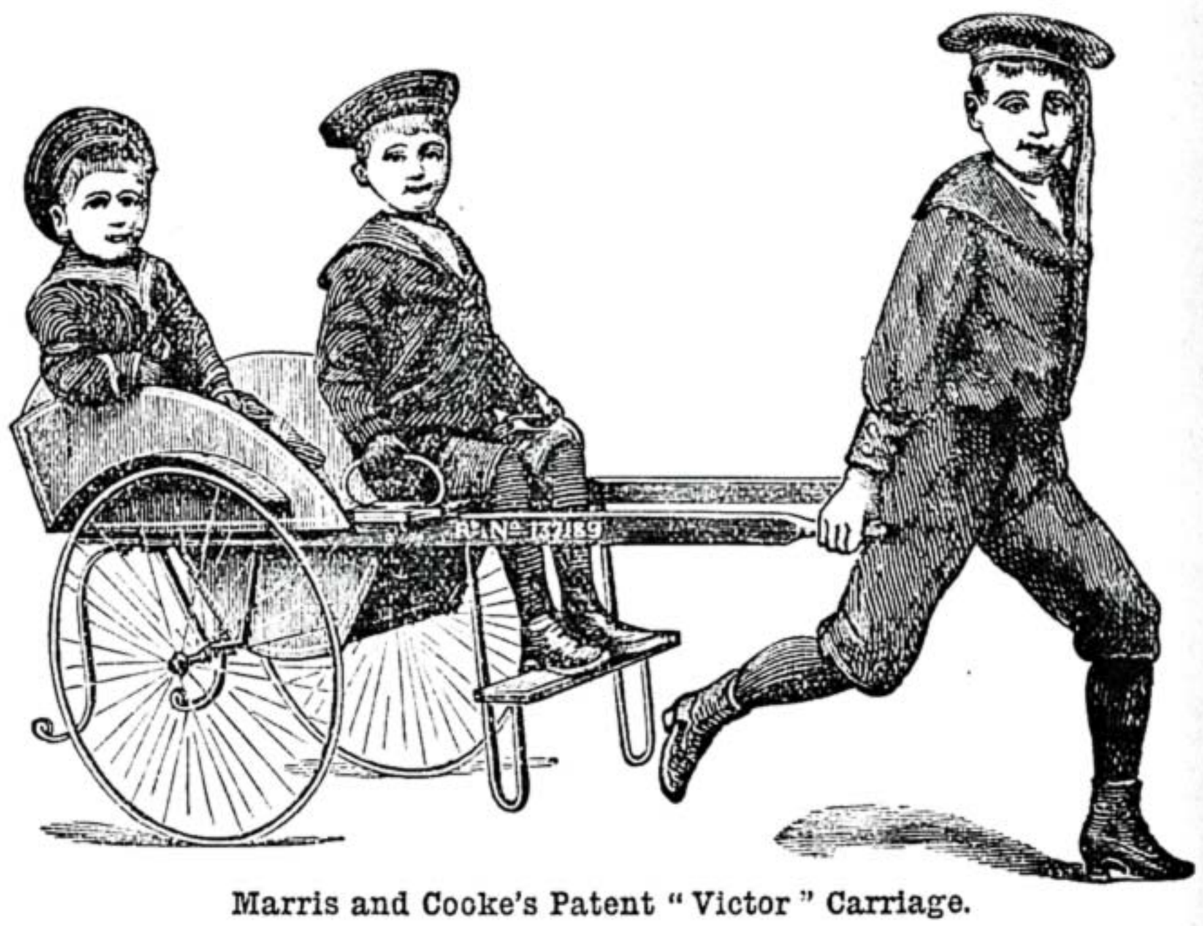
As regards the thickness of the metal, it may be of 12 in., 13 in., or 14 in. *sheet metal gauge*, not B.W.G.; and the ground may be of almost any colour.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of WORK for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of WORK without charge, the notices given partake in no way of the nature of advertisements.*

17.—MARRIS AND COOKE'S PATENT "VICTOR" CARRIAGE.

THE "Victor" Carriage, of which an excellent illustration is given below, is a capital form of cart for children, recently invented and patented by Messrs. Marris and Cooke, Grimsby, who are the sole manufacturers. The back part consists of a seat with a well in front and back and long sides above, affording room for one child, while another can occupy the seat in front and be safe against being thrown off by any sudden jerk, because there are handles, one on each side of the seat, which he can grasp with his hands, and a step supported by irons on which he can place his feet. Absolute safety is ensured against tipping too far forwards or backwards by the S-shaped irons behind and the irons that carry the step in front. Since its first introduction the inventors and makers have added several improvements, which they have also patented, namely, a reversible back to the front seat, enabling a child in front to sit with his back to the horse and put his feet in the well, thus permitting both occupants to be covered with a rug in cold or wet weather. The shafts also, instead of being rigid and unmovable as shown in the engraving, are made separate from the cart, and so contrived that when the bolts that hold shafts and cart together are put through the bottom holes of plates, the shafts are straight and in the right position for the carriage to be drawn by a boy; but when the bolts are put through the top holes of plates the handles of the shafts are raised nine inches, thus rendering the carriage more convenient to be used as a perambulator. The price of the carriage, as shown in the illustration, is 32s. 6d.: for reversible back to front seat 5s. extra is charged, and 3s. 6d. extra for patent adjustable shafts.



Marris and Cooke's Patent "Victor" Carriage.

THE EDITOR.

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SHOP:

A Corner for Those who Want to Talk It.

NOTICE TO CORRESPONDENTS.

*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

Fretwork Designs.—C. D. (*Camberwell*) writes:—"I send a suggestion for copying fretwork designs, hoping it will be of service to some of the subscribers to your most valuable paper. The articles required for this are an ordinary hektograph, hektograph ink, and a medium-pointed pen. Having procured a design you wish to copy, (1) dip the pen in the hektograph ink and trace over the design with it. (2) Place design on the hektograph, remove, and print off in the usual way. By this means a clear and distinct copy of the design will be obtained to about the number of 30 (if required). If any one is unacquainted with the hektograph and its uses, I would be glad at a future date to state how to make and use it."

Gassner Dry Cell.—G. H. (*Middlesbrough*) writes:—"Will you kindly grant me a little space in 'Shop' to give my experience with the 'Gassner Dry Cell'? I have seen some inquiries about same in WORK, but have not seen anything like satisfactory answers to questions put well to the point. I have bought five altogether at different times, the first two cells about eight months ago, and three more about Christmas, and I find them to vary very much in E.M.F. The first one I got gives a very good current, much stronger than a 'Leclanché,' while the others do not reach that standard; three of them are somewhere between a 'Daniell and a Leclanché.' The last one failed altogether in about a week. I then made up a four-cell chromic acid battery, and connected it to the cell, of course the positive pole of battery to positive pole of cell, and left them about an hour and a quarter. At the end of that time I tried the cell, but it would not do any work, so I took it back to where I bought it, intending to get another in place of it, but before I left the shop I made up my mind not to trust them any more, because the shopkeeper (a friend of mine) told me he had one returned only a day or two before I went with mine, and he showed me another that had broken down in the shop. While trying it the terminal came away in his hand, and, upon examination, it could be seen that the terminal was merely screwed into the top of the carbon rod (very coarse carbon, by the way). It was not coppered or capped in any way. In fact, after it was once out it would not hold at all; it would slip in and out quite easily. I think it was only held on by the marine glue, or whatever it is. Well, to sum up, I think they would be a useful cell if more pains were taken in the making of them. It would not cost much to lead-cap them in the first place. It cannot be done when they are made up, because the carbon of this one I saw was quite wet, and the hole was entirely filled with a thin milky-looking liquid. I cannot, of course, say if they are all alike, but I expect they are; at any rate, I will not buy any more until I am assured they are capped, and a little more care taken in charging them, so as to have them something like uniform."

Slide Rule.—H. E. (*Clapham*) writes:—"I read on page 28, Vol. I., F. C.'s reply respecting the above, and, after a search, J.'s answer on page 797 of last volume. Whatever the original query was I do not know, but as a daily user of this most useful instrument, I certainly cannot agree with F. C.'s remarks. My fellow subscriber evidently knows very little about the matter when he says, 'I always found I could work more rapidly on paper than by this much-praised instrument.' As to the use of the rule for accuracy, I may mention that it is in constant use by the officers of H.M. Excise Department, which fact will speak for itself, and by its use the drudgery of computation is avoided, and the time and trouble expended on mere arithmetical workings proved to be a waste of effort; in fact, the slide rule is to arithmetic what shorthand is to ordinary writing. From the tone of J.'s remarks, I presume it is an engineer's slide rule that is wanted, and these are manufactured by Messrs. Jno. Rabone and Sons, of Hockley Abbey Works, Birmingham, and they publish, for about sixpence, a very useful little book, the title of which is 'The Routledge Engineer's Slide Rule.' They also make a carpenter's slide rule, and keep a book to show its uses; and our friend J. is right, the rule costs about 4s. 6d. I copy from Messrs. Rabone and Sons' book that 'many kinds of slide rules are used under different names, but they are all constructed upon one general principle, and show results by the same unerring law, the only difference in them being that each kind is adapted to suit the particular special purpose to which it is intended to be applied.'"

Treatment of Cuts.—MEDICUS, in reply to J. C. K. (see page 12, Vol. II.), writes:—"I say that I did not 'overlook the distinct statement that the treatment of cuts by French polish, and using pins to close the wounds, was offered as the best in cases of emergency,' but said that such measures are utterly wrong, and opposed to the principles of surgery, whether the case be one of emergency or not. J. C. K. seems to forget that 'hospital procedure,' as he terms it, is based upon common sense and vast experience, and that the means I suggested for treating injuries are just as available as those he so unwisely put forward. I do not purpose discussing surgical treatment with one who shows plainly that he has not mastered even the most elementary principles in spite of his 'forty years' long experience.'"

Glue for Earthenware.—INQUIRER (*Jersey*) writes:—"I am pleased to notice the statement made by M. R. (*Burnley*) (see page 27, Vol. II.), but he did not state whether there would be any likelihood of the edges becoming detached from each other through heat or moisture, as such would be liable to be submitted to in a domestic manner. An explanation to same would oblige an inquirer at an early date."

Boot and Shoe Making.—J. R. (*Hillsboro'*) writes:—"I would thank G. H. (*Bishopsgate*) to give me the name of the various shank irons, and description for any finish on waist. (1) Should the feather for a broad welted boot be the same breadth as for a close welt? (2) How do you cut a pair of shoe tops to last less than the full measure—I mean from edge to edge across the sole? (3) How to dress up a pair of welts before sewing, should there be a little bit taken out of edge with knife? Surely this is not a difficult or vague thing to answer."

Glaze for Porcelain.—B. J. T. (*Tunstall*) writes:—"I have just received my monthly part of WORK, and was somewhat amused at M. M.'s description (to W. B., *Holloway*) (see page 781, Vol. I.) of how to glaze porcelain. I think M. M. or any one else would have their work cut out for them if they thought of glazing it from the description given. Having to make the glazes used at one of the large factories in Staffordshire, I herewith send particulars of how it is prepared for general purposes, though, of course, we have different kinds for different purposes. They are mostly made on the same principle, and from the same materials in different proportions. The method followed is by, firstly, sifting the materials through a wire sieve. These consist of borax or tincal, and sometimes boracic acid and soda, with Cornish stone, felspar, flint, Paris white, and Cornish clay. These are well mixed together, and put into a furnace, or, as we term it, the fritt kiln. Here they are allowed to remain for three hours, or until they are all properly fused. Afterwards the mixture is run into a vat and water poured on to it, and when cold it appears as a kind of glass. This is then weighed, and more stone, flint, and lead, according to the recipe in use (which, I may say, varies with most manufacturers). It is now ready for grinding, which is done in mills specially arranged for this purpose, and the grinding continued for about fifty hours, water being added occasionally. Afterwards it is transferred to another vat containing a number of magnets, which take out any particles of iron that may have got into it during the process of grinding. If wanted of any particular shade other than white, it is coloured by stains prepared for the purpose from different metallic oxides, etc. The method of applying it to the ware is similar to the description given by M. M., after which it has to be passed through the kiln to burn it on to the ware, which brings out the brilliancy of the glaze."

Combined Mitre Block and Cramp.—KILDONAN writes:—"I am pleased to see that the sketch I submitted (see page 636, Vol. I.) has found at least one who approves of it. In answer to KILBURN, I should say that it seems to me immaterial how he makes the central triangular piece so long as the conditions of accuracy in the angles are kept. As a matter of fact, I made mine in one piece, and made the saw kerf after it was fixed in position. I will not go into details. My method of procedure would harrow up the souls of all experienced workmen: therefore I refrain."

II.—Questions Answered by Editor and Staff.

Ear Drums.—DEAFNESS (*Pallasgreen*).—You should apply to an aurist for information on the subject on which you write. I cannot permit the pages of WORK to be opened to what might turn out to be a long discussion on the merits or demerits of a patent appliance for remedying deafness. You must not think that this reply indicates any want of sympathy on my part, but it is a matter altogether beyond the province of WORK, and to ventilate it in any way would deservedly draw on me the rebuke implied by the old saying—*Ne sutor ultra crepidam.*—ED.

Band Saw Wheels.—S. A. (*Enniskillen*).—You can get the wheels from any maker of light machinery, and very likely by advertising in a paper like WORK you might get a second-hand pair cheap.—F. C.

Key.—E. M. (*Glasgow*).—I think you would be able to get the parts of locks, etc., you require from Messrs. B. Walters & Co., lock manufacturers, Willenhall, if you want them in large quantities; or in smaller from Messrs. Skinner & Co., Blackman Street, London, S.E.—T. W.

Roller Composition.—A. A. (*Manchester*).—We are unable to give you the recipe for making the patent (*patent*, mind) "durable" roller composition. It is the result of years of experiment on the inventor's part, and even if you obtain his specification, in which of course he is bound to set forth the recipe, he, if he is wise, will have further protected himself by keeping some one little point of his experience, which any would-be imitator would have a great deal of loss and trouble to find out. It would save you much loss both of time and trouble, and of material and annoyance resulting from imperfectly carrying out what requires great care, long experience, and expensive plant, quite incommensurate with the small amount you might expect to save, by purchasing from someone who is agent to the "Durable" Roller Composition Company, Limited, 57, Shoe Lane, E.C., who rigorously prosecute anyone who infringes their patents.—J. W. H.

Wood Engraving.—INVICTUS.—Wood engraving *per se* presents so many difficulties that, we fear, it could not be taught by any instruction book; at any rate we have never seen any that would give any assistance to a "tyro" such as your letter admits you are. The "hold" of the tool takes weeks of constant practice to acquire; the proper sharpening of the different tools used, and the keeping them in proper order and sized suitably for the work, would take at least twelve months' constant devotion of some hours a day, and this would be next to impossible without seeing the various operations properly performed, with minute detailed counsel as to the attempts to succeed in imitating them. Again, it may seem paradoxical, but it is perfectly true, that to engrave in outline on wood, even by a good journeyman engraver, is frequently more difficult than to *shade* the same drawing, and will absorb much more time. Nowadays the "shading" is nearly all done by the tinting machine. If INVICTUS still feels "fit" to attempt his self-imposed task he can obtain the wood blocks of any size at from 1d. to 3d. per square inch according to quality ready to draw upon from Mr. Edward Badoureau, 14, St. Bride Street, E.C., who also supplies tools ready made up for use, eyeglasses, sandbags, and every other requisite.—J. W. H.

Book on Printing.—R. C. (*Bexley Heath*).—The article you mention appeared in No. 275 of *Cassell's Saturday Journal*, January, 5, 1889. The handbook you want, we presume, on letterpress printing (although you do not make this very clear), we think you will find in Messrs. Cassell & Co's. series. Write to their publishing department for list, and you may also write for list of "Wyman's Technical Series," published at 65, Chancery Lane, if you wish for information on kindred branches of the art of printing.—J. W. H.

Perforated Zinc.—G. T. S. (*Barnsley*).—The following are the addresses of some of the principal manufacturers and dealers in zinc, both plain and perforated, in various gauges, sizes, and patterns. Frederick Braby & Co., London, 352, Euston Road; Liverpool, 688, Hatton Garden; Glasgow, Petershill Road; Croggon & Co., 16, Upper Thames Street, London; Davis Brothers & Co., Crown Works, Wolverhampton; the Redcliffe Crown Galvanised Iron Company, Bristol.—R. A.

Fire Lighters.—R. J. (*Dublin*).—Mix a very little of the tar, barely sufficient to make the mixture sticky, with the sawdust, and subject the latter to heavy pressure. The cake can be cut up into blocks or sticks as required, and will make capital fire lighters.—F. B. C.

Indiarubber Type.—EXPERT (*London*).—The manufacture of date-bands and solid and rubber-faced type is a branch of the indiarubber stamp making business, requiring expensive special appliances, and with which I have no practical acquaintance.—QUI VIVE.

Imitation Stained Glass (Patent "Glacier" Window Decorations).—PLEASURE AND PROFIT.—I am unable to give any detailed information about the manufacture of above. They are produced by lithography on specially prepared paper; the latter, however, does not appear to be common property. Messrs. McCaw, Stevenson, and Orr, of Linenhall Works, Belfast, were the original patentees of the process, but I could not say whether the patent is still in force. No doubt the official Patent Blue Book, which you can buy at the corner of Cursitor Street, Chancery Lane (cost, 6d. or 8d.), would give the information required.—F. B.

Harmonium Reeds.—T. J. E. (*Bristol*).—You cannot do better than apply to the American Organ Agency, 2, Oseney Crescent, London, N.W.

Silver Plating.—G. W. B. (*London*).—Articles on silver plating will be given in WORK in due course. We have not yet taken up the subject, but it is on my list for treatment at an early date. Meanwhile, I would advise you to get your mouthpiece plated at one of the shops in Clerkenwell. They will do it better and cheaper than you can do it yourself.—G. E. B.

Electrotyping Stereos.—ELECTRO (*Gloucester*).—You have started wrong, hence your failures. In the first place, a Bunsen is unsuitable, because it causes the copper to go on too fast. Use a Daniell, a Smee, a Walker, or even a Wollaston battery in preference. In the second place, you use a wrong solution. Your solution is poor in copper, and it has too much acid. Dissolve as much sulphate of copper as a pint of warm rain water will take up, add one ounce only of sulphuric acid, and make up

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to 1½ pints with cold rain water. The anode will do, if it has the same surface area as the stereo to be copied. You cannot successfully take a copy of the stereo in copper direct. A copy of the stereo must be taken in yellow bees-wax, or gutta-percha, this coated with blacklead, and the copper deposited upon this blackleaded mould. See paragraph on page 458, Vol. I., on blackleading. See also note on page 262, Vol. I., on how to treat a finished electro. It will take from eight to twelve hours or more to get a shell thick enough to print from. I have an article on "How to Copy Busts, etc." (now in the Editor's hands) which will help you.—G. E. B.

Gilding Solution.—A. B. (*Wednesbury*).—You impose conditions which cannot be met or complied with. I do not know of a cold gilding solution made up without cyanide of potassium, which will dissolve the anode freely. Cyanide of potassium is needed as a solvent for the anode in all solutions for electro-gilding. Roseleur's cold gilding solution is made up of:—Fine gold, 10 parts; cyanide of potassium, 30 parts; liquid ammonia, 50 parts; distilled water, 1,000 parts. The gold is converted into the terchloride of gold, and this dissolved in distilled water. The liquid ammonia is added to this, and fulminating gold is thrown down as a brown precipitate. This precipitate is washed on a paper filter, and dissolved at once with the cyanide of potassium solution. The water is now added, and the solution boiled for an hour to drive off excess of ammonia. Care must be taken in making this solution not to dry any of the precipitate, as it is a dangerously explosive substance.—G. E. B.

Time Alarum and Electric Bell.—J. K. (*Manchester*).—I am sorry you should have suffered any delay in completing your bell and time alarum, on account of lack of detail in my papers on these subjects. The letters B.W.G. following after a number in a reference to wire show that the diameter of the wire was measured in the Birmingham Wire Gauge. The sizes of wires are usually expressed by numbers, and those of the Birmingham Wire Gauge are given, because this gauge is the best known. Respecting the quantity of wire required on each bobbin of the magnet cores, follow the rule here given:—Multiply the diameter of the bobbin by three, and this will give you, nearly, the length of wire for one coil; find out how many coils of your wire, laid side by side, will lie in an inch of space, then measure the length of the bobbin, and calculate how many coils can be laid on it from end to end, or between the two flanges of the bobbin (No. 24 B.W.G. will run to about thirty coils to the inch); then measure the depth of the flanges and find out how many layers will fill the bobbin (also coils to the inch). Next, multiply the length of one coil by the number of coils the bobbin will take between the flanges, and this by the number of layers of wire coils which may be laid on the bobbin; this will give you the length needed for each bobbin, with, probably, a slight excess for connections. No. 24 will run to about 162 yards in the lb. One of the line wires leading from one pole of the battery must be connected to the binding screw to which the wire from one of the magnet coils is fastened. The other end of the wire from the magnet coils is fastened to the armature spring; this spring touches the platinum pin of the contact screw, and thus connects it with the contact posts. If now we connect a wire from the other pole of the battery to the contact post, or to a binding screw connected with this post, the bell will ring. The current goes through the magnet coils, the magnetism attracts the armature and pulls it away from the contact pin; this breaks the current for an instant and the magnets let go their hold, whilst the spring jerks it back again. This causes the to and fro movement of the armature. More will appear later on about connecting alarums to bells.—G. E. B.

Silicine Glass Painting.—V. M. W. (*Leicester*). Any artists' colourman will supply you with the materials you want.—C. B.

Case Hardening.—F. W. R.—"Case hardening" means that just the outer part of metal which comes in contact with the part against which it works is hardened, and of the nature of steel. Only wrought iron is treated thus. It may be effected in two or three different methods. A mere film of surface hardening may be effected by heating the iron red-hot, rolling it in powdered yellow prussiate of potash, and quenching in water. When the hardening is required to extend to a depth of $\frac{1}{32}$ in. or $\frac{1}{16}$ in. the work is enclosed in a cast-iron pot along with leather clippings, bones, horn, and yellow prussiate of potash, and subjected to the heat of a reverberatory furnace for from twenty to forty hours. The work is then turned out into water.—J. H.

Writing Desk with Folding Flap and Secret Compartment. — CAMPBELL (*Glasgow*). — In the sketches here shown I think you will find what you require. It is somewhat different from the usual run of desks, and I have designed it to possess a secret compartment. Your reason for wishing to have this latter is no doubt because you consider it necessary or convenient to be able to hide private letters from prying hands and eyes. Any wood will be suitable, but a light wood is preferable. The secret compartment is entirely out of sight in Figs. 1 and 2, and if you construct as I instruct, no one will dream of its being where it is. You want two sides, each 10 in. long on the back and front edge, and about 12 in. to the top of the serpentine shaping, and 9 in. wide. A board 13 in. long and 9 in. wide (G in Figs. 3 and 4) will be fixed between these two at the bottom. A back-board 13 in. long and 9 in. wide (F in Figs. 3 and 4) will also be fitted between them. The top board, which forms the bottom half of the case when open, will be 13 in. long and 8½ in. wide, and will fall over the edge of the back-board, where it should be fastened with a lock. The top half of the flap, which forms the front of the desk, will be the same length and 5 in. wide. These two pieces are hinged together in the middle as in Fig. 2, and the last-mentioned half is hinged to the division above the drawer. A piece of wood about 1¾ in. wide may be fastened on the top piece to answer the purpose of a handle; and when the flap is down (the top part comes right over, bringing with it the front part) it will serve to support it. A small fastening, similar to an ordinary catch, must be fitted, as shown, to the flaps, to prevent them falling together when leaned upon by the user. The stationery box must be made separately, and not joined to any part of the desk. It should be 5 in. wide; the front board might be 5 in. high,

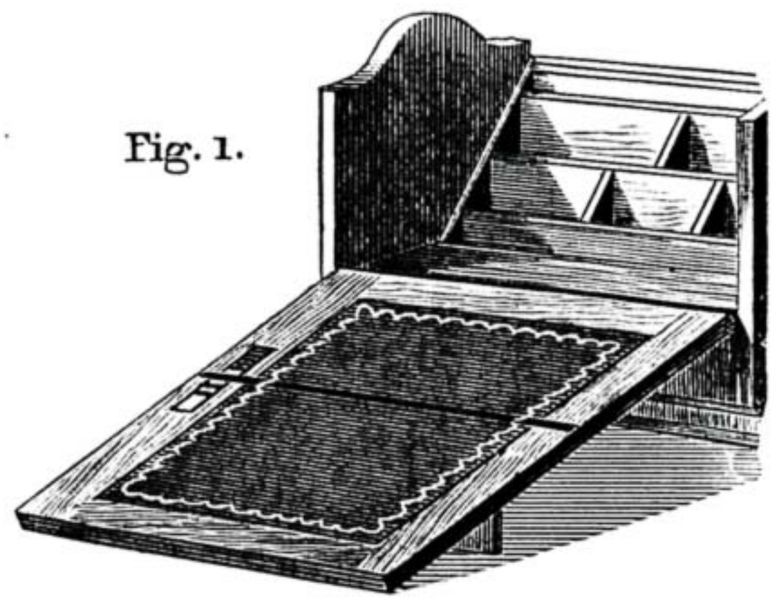

Fig. 1.

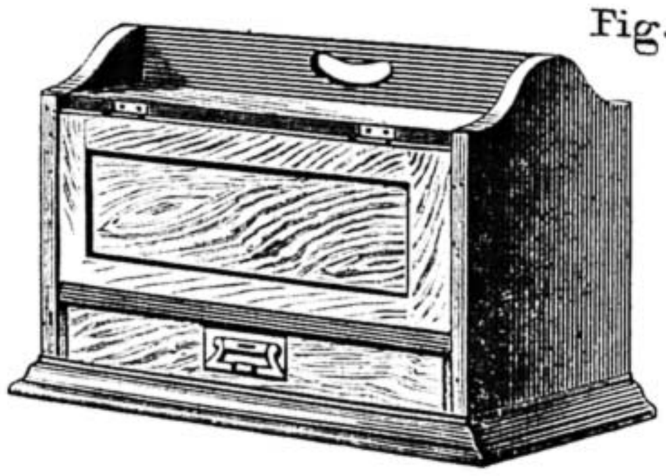

Fig. 2.

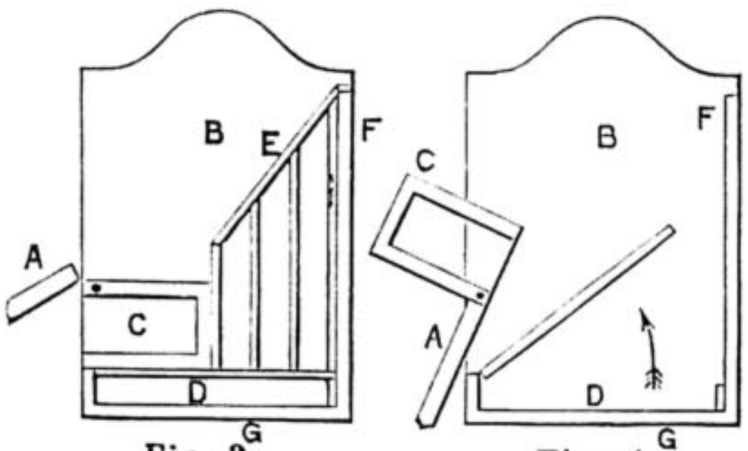

Fig. 3. Fig. 4.

Folding Writing Desk.

the second board 6 in., the third 7 in., and the back-board 8 in. Three compartments in front will serve for envelopes, two behind these for note-paper, and the back one for foolscap; and here let me say that if you do not want the desk to contain foolscap paper, you can make a smaller article by proportionately reducing my measurements. Next we want two boards, each 13 in. long and 4 in. wide; another the same length and 2½ in. wide, to fit between these last two at the back; two small pieces, each 3½ in. long and 2½ in. wide, to fit in between them at the ends; this gives us the part into which the drawer will go. It must work on a pivot as in Figs. 3 and 4. A is the writing flap, B the side of the desk, C the drawer, D the secret compartment, and E the stationery box. A hole should be bored through the sides of the desk, and a pin driven through it into the top thickness of the drawer box. The hole should then be filled up as neatly as possible, to hide all traces of the pivot. A piece 1 in. deep, on to which is hinged a lid, as shown in Fig. 4, will be fixed under the drawer box in the front of desk. Three narrow pieces must be fitted in the secret compartment to support this lid. Now, if a lock or fastening of some description is fitted at the back of the drawer box, so that it and the stationery box can be firmly fastened together, it will be impossible for any one to discover the secret space. To get at this space, it will be necessary to take out the stationery box and pull the drawer box round on its pivot, as in Fig 4. A deep moulding should be mitred up all round the desk bottom for about 1½ in. For thickness of wood, make all except stationery box, drawer, and secret compartment fittings, ½ in. thick, and allow a little extra for joining. Line up inside of flap with leather, and panel or leave plain, according to taste, the front.—J. S.

Lathes—Earthenware.—BARRA.—The weight of a fly wheel suitable for a lathe depends upon the work which will be most commonly done. For example, a wheel which will be driven quickly, for light wood turning, would not be as heavy as one which goes slowly for taking cuts off metal. BARRA need not be very particular as to weight; anything from fifty to one hundred pounds, or even more or less, would suit, and, of course, be better than a grindstone. With regard to earthenware drillings, I have succeeded in drilling half inch holes through half an inch thick with an ordinary diamond-pointed steel drill, made thin and very hard. It must be constantly sharpened, and the work is not pleasant at the best. A method which I have read of as producing excellent work is as follows:—Use as a drill a piece of soft brass or copper tube, charging the point with diamond powder, corundum, or emery; revolve in a lathe or vertical drill, and it will be found to grind or cut out a circular piece the size of the internal diameter of the tube, leaving a hole in the work the size of the external diameter. This might be driven with a brace, but would require great steadiness. Charge frequently with the powder mixed with oil. Many thanks for your kind wishes.—SELF-HELPER.

Thread of Nuts.—J. A. (*Liverpool*).—Make the depth of the thread equal to its thickness, then its bearing and shearing resistances will be equal.—F.C.

Book on Dynamo Building.—G. L. (*Pimlico*).—There are several books on the subject. "The Dynamo: How Made and Used," by S. R. Bottone, initiates the amateur into some of the principles, illustrated by directions on how to build a small Siemens dynamo. "How to Make a Dynamo," by A. Crofts, is another simply written, instructive little book on the subject, showing how to build a Gramme dynamo. Then there is "Practical Dynamo Building for Amateurs," by F. Walker, introducing a little more technical work than the others. If you want something in advance of these, get Professor Thompson's large book on the subject. Perhaps you may learn something from my articles, "Model Electric Lights," which will appear shortly, as I have a little to say in those on dynamo building.—G. E. B.

Silvering Reflectors. — CARBON. — Copper reflectors for lamps may be silvered by the electro-silvering process, and then burnished to get the requisite bright polish. This silvering will be most durable. A cheaper but less durable coat of silver may be put on by the simple silvering process. The paste for this process is made by mixing together equal weights of silver chloride, freshly prepared, and cream of tartar, in a mortar, and rubbing them well together until the paste is quite smooth. The copper reflector must be polished to a mirror-like brightness, free from any trace of grease or animal pollution. It must then be coated with the paste, and well rubbed in every part with a piece of soft cork until coated with silver; then rinsed in hot water, and dried by polishing the surface with a soft linen rag. Many of the small cheap reflectors are merely coated with tin, and then highly polished.—G. E. B.

Renovating Leather.—C. H. R. (*Leeds*).—If the leather of your suite is merely dull you may improve it by going over it lightly with a little French polish. Do not on any account saturate the leather, which you would make worse than it now is by doing so. The cutting you send looks all right, and requires nothing doing to it. If the surface has got broken you had better not attempt to restore it, for you will not be able to do so. Of course the leather is only common stuff, but you could not expect the suite to be covered in best morocco at the price you name. You paid for "shoddy" things, and you probably got them, so there is no reason why you should feel disappointed. When people are willing to pay a fair price for fair work and materials to good upholsterers, such things as your suite will cease to be an article of trade. If you had gone to a first-class shop and inquired the price of a suite similar to yours, you would probably have been told that the price would be about double. You must blame yourself, not the things.—D. A.

Coloured Book of Designs for Sign Writers.—A. S. (*London, N.*).—The only work of the kind such as you require is "The Art and Craft of Sign Writing," by William Sutherland, price one guinea, from Mr. W. G. Sutherland, 15, Saint Ann Street, Manchester.—H. L. B.

Lincrusta Methods.—H. C. (*Liverpool*).—You will find the information you want given in "Shop" in a previous number.—E. D.

Filter.—PLEASURE AND PROFIT (*London, W.*). The only filter I know of that comes anywhere near the name you mention (Lipscoomber) is Libscomb's, and the only refitting they require is to either remove and thoroughly cleanse the filtering media, or replace it with new; and as this media is generally the invention of the manufacturers, it can only be obtained through them. I think you will find that this also applies to nearly every make of filter.—E. D.

Theatrical Lime-Light Boxes. — MECHANIC (*London*). — Theatrical lime-light boxes, with coloured shades and all necessary accessories, may be had from Walter Lawley, 78, Farringdon Street, London. These will suit your *tableaux vivants*.—H. L. B.

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Violin Belly.—VIOLIN (*Manchester*).—The back or belly of a violin is removed by inserting a knife (not too sharp) between the "ribs" and the part you desire to take off. This seemingly simple operation is one which requires great care, especially as regards the belly. By all means try your hand with a common instrument to begin with.—B.

Lubricant.—H. L. D.—No lubricant is used for brass or gun-metal. If the castings get hot you run the drills too fast. Brass and copper tubes are bent cold, being first filled with sand.—J.

Cast Chains.—AUREA CATENA.—The only chains that I am aware of that are cast are made in steel, for which patents have been taken out. But I have never seen any, and do not think they are used to any large extent.—J. H.

Artificial Frost for Lettering Purposes on Windows.—TRADESMAN (*Farnworth*).—It is almost impossible to put any kind of paint on windows to represent frosted glass. The glass itself is made with artificial frost upon it, and that is all that can be said. Give the glass a thin coat of white paint, and then work the surface with a dry brush and imitate as near as possible.—H. L. B.

Scene Painting.—J. C. (*Winnington, Cheshire*).—It would take a whole page of this portion of the paper to describe, even in a concise manner, the process of scene painting, especially to a novice like yourself. Send sixpence in stamps to S. French, 89, Strand, W.C., for "The Art of Scene Painting," which, although only containing about a dozen pages of matter, will tell you more than I can here. A series of articles, entitled "Scene Making and Scene Painting," appeared in the new volume of the *Journal of Decorative Art*, which commenced with the January part. It is 7d. per month, and published by Henry Vickers, 317, Strand, W.C. These papers treat fully on scene painting in all its branches.—H. L. B.

Wood Letters for Signboards.—W. R. H. (*Minories, E.*).—It would not pay you to make these. They are turned out by special machinery, and the wood has to be specially prepared, I believe, by steaming, etc. Besides, the home-made article would soon split in all directions. However, I refer you to an article in No. 35 of this journal, page 550, Vol. I., entitled "Solid Letters for Shop Front Facias." There are several shops in Holborn and Gray's Inn Road where wooden letters are made and sold, but I prefer Willings' enamelled iron letters, or those made by the Patent Letter and Enamel Co., Limited, 144, High Holborn, W.C., who will send illustrated sheets and price lists on application.—H. L. B.

Lock Repairs.—A. M.—There appears to be no book upon this subject. Am glad you like the articles upon the matter in WORK.—T. W.

Enamel Paint and Bronzes.—F. W. M. (*Norfolk*).—Enamel paint is made in a great variety of colours, and by a score of different manufacturers. Aspinall's is the best advertised, and hence the most used. If you cannot purchase near at home, they will send a small tin, post free, for 1s. 6d. The same size, marked 1s. 3d., can be bought at "store price" in most towns, 10½d. Enamel paint is quick drying, and if desired to be spread evenly on large surfaces, requires a painter's practice, and a soft or nicely worn brush. Bronze powders can be bought of any dealer in painters' and gilders' tools. Aspinall's factory is—Hollydale Works, Peckham, London, S.E. Let us have something more worth printing if you write again, as a few inquiries in your own neighbourhood would surely have obtained answers to the above, and "Shop" space is very valuable.—F. P.

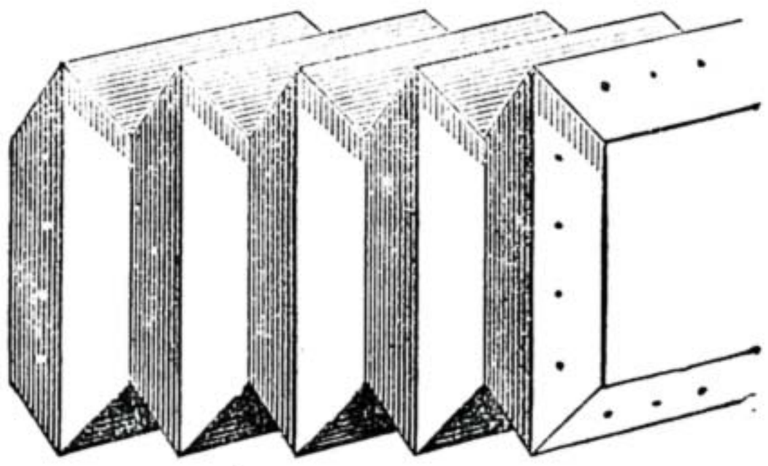
Distempering.—H. G. C. (*Great Yarmouth*).—There is nothing that can be added to distemper in order to make it dry "shiny and smooth," so far as I am aware. Excess of size or glue in water colour will often give an "egg shell" gloss, but the amount of size there must then be in the distemper will probably cause it to crack and peel off. Unless used upon walls, distemper is best with only sufficient size to bind it, and not to show any gloss whatever. The "dead" surface of distemper is one of its chief attractions. Twenty and more years ago walls were sometimes distempered, and then polished with French chalk, but it is very seldom done now. The satin surface of some wall papers is obtained, I believe, by such a process. Smoothness will depend upon the preparation of the stuff, condition of the surface to be covered, and the proficiency in spreading it.—F. P.

Graining.—A READER (*Newton Heath*).—Instructions for making and using graining colour have been given, as far as space would permit, in recent answers in "Shop." These, I hope, will suit your case also. I cannot further aid you, as you are only making a general inquiry. Friends who really want practical help *must* put their queries into definite form, and say *precisely* what they wish to do, otherwise time and space are but wasted. Graining will, I believe, soon be practically treated in WORK, and, if possible, wood cuts of figures, and characteristics of woods and marble, will accompany same. If you have a special need beyond ordinary matters, write again, and I will help you.—F. P.

Battery for Time Alarum.—F. G. (*Bow*).—A No. 2 Leclanché will not furnish power enough to properly ring a 3-in bell through 22 yards of wire and the alarum clock, unless the magnets are wound with a short length of wire and all the parts nicely adjusted. Your alarum hand, too, although very inexpensive and ingenious, adds to your trouble by being made of steel. Had it been made of brass, it would have offered less resistance, and your battery would have had a better chance. You must have a battery of at least two No. 2 Leclanché cells, connected in series, to properly ring the bell. If the wire is well covered and properly laid, as directed in my articles on burglar alarums, you need not fear leakage from having them only two inches apart.—G. E. B.

Electro-tinning Iron Goods.—IRONMONGER (*Marylebone*).—Iron goods have been and can be electro-tinned, but I do not think they can be done more cheaply than by the ordinary tinning process. You would require the ordinary plater's plant of vats, solutions, lathe, brushes, battery or dynamo machine, acids, and polishing materials. At the lowest estimate the cost of plant would not be less than £50. This subject will come up for treatment in due time.—G. E. B.

Camera Bellows.—CAMERA (*Shipley*).—To make a camera bellows, proceed as follows:—Procure a supply of either thin marone leather or bookbinders' cloth and buckram, with some strong paste; then buy all the materials required for either leather or cloth bellows. For the sake of economy, it is as well to cut out a paper pattern of the necessary size before cutting out the leather. For a square bellows, an oblong piece is required; each side of the proper size to attach to the framing of the camera, and the length to be determined by the amount of extension wanted. The buckram being cut out to the proper dimensions, smoothly paste the leather upon it and allow it to get nearly dry. Then rule a series of lines, one inch apart, as a guide to folding, which must be done in a fan-shaped manner, folded and dried under a little pressure. Lines having been previously marked to correspond with the corners of the camera, the material is sharply creased along them; the pressure of a warm iron may be used to make it retain



Camera Bellows.

the fold better. Now bend the creased material so that the first fold may be at right angles to the second, and with the finger and thumb pinch the corner thus formed, so that they will permit extension or compression without difficulty. The sketch above represents how the corner should appear when finished. A little extra width must be allowed for overlap in closing up the bellows. For conical bellows, the only difference is that instead of the material being cut in the form of an oblong, the ends are measured to fit the front and back of camera frames, the secondary lines and creases being made from the corner of the large end to the corner of the small end, thus giving a somewhat triangular shape to the material; the folds will be straight across, as in the square bellows, and the corners pinched up in the same manner: a slight allowance must be made in the length to compensate for the shortening produced by the folds. After the bellows are joined up and dry, the inside should have a coating of dead-black varnish, made by thoroughly amalgamating fine lamp-black with thin shellac spirit varnish, until it is of a suitable consistency—a sort of thin cream. This well brushed over the buckram leaves a perfectly dead unreflecting surface. The two ends of the bellows should have the last folds left turned inwards, to be attached with glue and small screws to the woodwork of the camera.

Battery for Lamp.—QUÆRITOR (*Manchester*).—All depends upon the voltage of the lamp. A 6-volt 2½ c.p. lamp might be lit up with current from three single fluid bichromate cells, but this would be driving matters rather close. A 25-volt 2½ c.p. lamp would require at least thirteen such cells connected in series. You may calculate on 2 volts each cell, 1 ampère for each 6 square in. of negative plate surface, and 6 ampère hours for each pint of solution. A suitable battery is described in my articles, "Model Electric Lights," which will shortly appear.—G. E. B.

Electric Repeater.—F. D. (*Crewe*).—I do not know of such a thing in the clock trade as an electric repeater. There may be such a thing, and I might be able to invent a method for making a striking clock repeat the hours by means of an electric arrangement, but I have no time to attend to such a thing now, and I think I should patent my invention before describing it in WORK. Perhaps some one of my colleagues in the clock business will oblige.—G. E. B.

Melting Temperature of Brass.—H. G. H. (*New Southgate*).—(1) As the composition of brass varies considerably, so does the temperature at which it will melt. Common brass may be taken as having a melting point somewhere near 1,900° Fahrenheit, or a little above a cherry-red temperature as viewed in the dark. The fusibility of brass increases with the quantity of zinc put in it, or decreases as we increase the proportion of copper. Bronzes require a temperature of from 1,922° Fahrenheit to 2,372° Fahrenheit, according to their proportions of copper and tin. (2) I cut sheet brass with a pair of stout shears, if it does not exceed ⅛ in. in thickness. Over this thickness I should use a sharp cold chisel, resting the brass on a soft iron plate or a block of copper. I have not seen your first letter.—G. E. B.

Permanganate of Potash Stain.—G. T. S. (*Barnsley*).—G. T. S. asks:—"What can I dissolve permanganate of potash in for staining wood, instead of dissolving in water, as water raises the grain of the wood, which has to be sandpapered down, and this takes off most of the stain and makes the wood look streaky?" Seeing that the action of such wood stains depends upon the known avidity of wood for water, I cannot see how a useful stain can be made up without it. The pores of the wood absorb water, and this carries with it the particles of the staining substance. I do not know of any solvent for permanganate of potash, free from water. Perhaps Mr. Adamson may be able to inform you how to avoid raising the grain of the wood and making the stain streaky.—G. E. B.

Perforated Zinc Sheets.—G. T. S. (*Barnsley*).—Perforated zinc can be got in any quantity and of any gauge required at the West Kent Zinc Works, Loampit Vale, Lewisham, London, S.E.—G. E. B.

Zinco Blocks, etc.—AMATEUR (*Cornwall*).—We cannot say anything as to articles on zincography, and refer you, as we have previously done other correspondents, to Josef Bock's little manual (Wyman's Technical Series) 65, Chancery Lane, E.C., 2s. 6d. You do not say whether the engraving machine is for wood, copperplate, or stone, but in any case we never heard of any machine that would outline, and regard it as an impossibility, unless by means of the pantograph. All so-called engraving machines are for "tinting," *i.e.*, ruling lines of uniform depth to produce the effect of shading, and even then the "tints," after being cut by machine, require "returning" by hand, that is, cut up to the outline, which no machine can do; it leaves always a certain uncut portion about ⅛ in. at both ends, to be finished after by hand. If you attempt to cut close up to the outlines, the tool would inevitably run through them in some places and spoil the work. The great care and perfect accuracy required in the fitting and construction of such machines must of necessity make them costly, and place them above the means of most amateurs—who further could not be expected to be sufficiently conversant with engraving to utilise them properly. An amateur would have less difficulty in sending his machine work out to a practical engraver to execute for him, a plan adopted by many wood engravers themselves, who would not have sufficient work to make it worth their while to have a machine of their own. Mr. E. Badoureau, Poppin's Court, Fleet Street, E.C., who supplies boxwood tools and all other requisites for engravers, would no doubt undertake this for you, and also any electrotyping you may require.—J. W. H.

Electrotyping Composition.—H. G. (*London, S.E.*).—We do not remember to have heard of any ingredients for incorporating with gutta-percha for electrotype moulds; we think that sulphur moulds would answer best for zinco blocks; they are sharper than either wax or gutta-percha, and would be no doubt largely used for wood blocks but for the heat required, which would injure wood, but could not injure zinc. They are used very extensively in electro-plating, and copying works of art in metal by the use of the battery. American type-founders, we are told, use them for copying type from electro matrices again to form copper matrices to cast in.—J. W. H.

China Cement.—W. J. L.—Like you, I should only be too pleased to meet with a cement that would join glass and china so as to stand heat and wear; I do not know of any that will do that. For small clean breaks I have used Lepage's liquid glue, but it has been for ornaments that are not much handled nor subjected to heat. Some of the cements sold make good joins, providing you heat the two parts very hot, and bind tightly with tape until perfectly set; in fact, the way of using cement has more to do with a strong join than the kind of cement used, the great point being to make the articles hot enough. Many are afraid to heat delicate glass or china, and therefore their failures. Shellac makes a very strong join, if both pieces are heated sufficiently to fuse the shellac; but the disadvantage of this is that it shows a dark mark upon a piece of white china. Should you wish to try experiments in making cements, I shall be glad to assist you with recipes if you will apply through "Shop."—W. E. D.

China Repairs.—H. S. B. (*Watford*).—(1) Both the drills and bits used in drilling glass and china are of a special kind, and used only for this work. The drill consists of a steel spindle about 14 in. long, tapering at one end, weighted by a piece of hard wood, and rotated backwards and forwards by tapes coiling and uncoiling round the spindle. The bits are diamond chips cemented into a tin holder made to fit the tapering end of the spindle. (2) No; I do not think the rivets can be bought ready-made, at any rate; it is usual to make them, and the operation is a very simple one. Take a piece of brass wire the thickness you wish your rivets to be, say 12 or 16 gauge, according to the

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size of the work; file or scrape with an old knife one side quite flat; turn down one end at right angles about $\frac{1}{16}$ in. (more or less), flat side underneath; place this in one hole, carefully mark where the other turn should come, cut off, turn down in the nippers, and the rivet is finished. (3) The cement used to fill up the holes and cracks is simply plaster of Paris mixed with a little water. Be careful to make the rivets fit as tightly as possible, and do not depend too much upon the cement for holding them in; in fact, if they need a gentle tap with a hammer to cause them to spring into their places, it will be all the better. Further questions I shall be glad to answer through "Shop."—W. E. D.

Red Stain.—F. W. R. (*Norfolk*).—Beech cane-seated chairs are finished in various shades of red, so that your question is rather vague as it stands. However, I suppose you want to know how to stain them in so-called imitation of mahogany. If this is the case, it may suffice to tell you that any mahogany stain will do, and that it is applied in the usual way. The manufacturers of these chairs usually, I believe, buy their stains; but if you want to make your own, you may do so with Bismarck brown, of which you can easily make a solution. If this is too red for your liking, reduce the colour with vandyke brown.—D. D.

Ebony Stain.—G. T. (*Kettering*).—To make a good black stain, boil logwood chips in water till the colour is extracted. Put iron filings in vinegar, and let them remain some time. A mixture of the two liquids forms a good black stain, depending for its intensity on the strength of the materials making it. If not deep enough in hue add a little gas black. Sometimes a little indigo is added. Black stain can be bought better and cheaper than it can generally be made on a small scale. If you want the colourless varnish for cabinet work strengthen good white French polish by allowing resin to dissolve in it.—D. D.

Easily-Made Fret Machine.—A. J. P. (*London, S.W.*).—Will endeavour to send another drawing of the work, page 651, Vol. I., "Easily-made Fret Machine," referred to by F. R. C. B. (*Camberwell*).

Patent Medicines.—W. H. (*London, N.*).—You do not make allowance for the necessary delay of publication.—C. C. C.

Electric Bell Construction.—W. B. (*Highgate*).—"Electric Bells and all about them," by S. R. Bottone, published by Whittaker & Co.; price 3s., is a good elementary work on this subject; from which you may learn the principles governing their construction. I should also advise you to get Mr. Allsop's treatise on "Practical Electric Bell Fitting," published by E. and F. Spon, price 3s. 6d. This deals with the details of electric bell fitting, and their maintenance in working order. You may learn something from the recently published articles in WORK on burglar alarums, as these give an illustrated description of electric bells.—G. E. B.

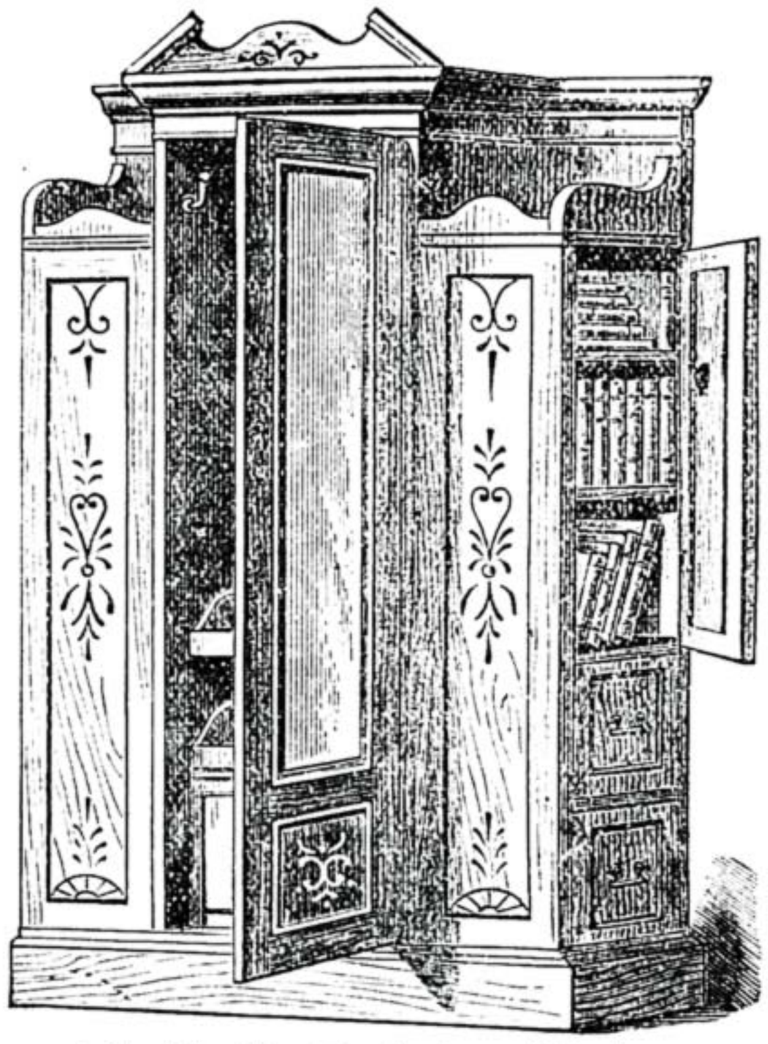
Gassner Battery for Electric Light.—J. H. H. (*Rochdale*).—Three cells of a Gassner battery will be useless to provide current for lighting up a small sitting-room with the electric light. I must refer you to my articles, "Model Electric Lights," which will shortly appear, for further information respecting the best battery to use for this purpose.—G. E. B.

Indicator for Electric Bell.—WORKIST (*Lambeth*).—You will find illustrated description of a good drop indicator on page 313, No. 20, Vol. I., of WORK. Others will be forthcoming in future numbers. The cost of making will depend upon how many parts of the indicator you can make yourself.—G. E. B.

Recharging Gassner Cells.—G. H. (*Middlesbrough*).—On receipt of your letter I communicated with Mr. J. T. Mayfield, 41, Queen Victoria Street, E.C., the London agent for the Gassner Patent Battery. In his reply he asks, "has your correspondent ascertained whether the patentees are ready to recharge the Gassner cells or not, or does he *assume* the contrary? We shall be ready to charge the spent cells at a very low price, but we cannot name a figure, as up to the present time there have been none to recharge. Your correspondent is looking well ahead, for we expect the cells to stand a few years of ordinary use before they will need recharging. It would be mere guesswork to say what is the real chemical action in the cells whilst at work, and also whilst being recharged, as the composition of their contents is kept secret. The wear of the zinc is uniform, so there is no danger of wearing through." A Gassner cell has been known to ring a 3 in. bell through 1 yard of No. 20 copper wire for 286 hours without stopping. It was then stopped for 24 hours to rest, after which it was connected up to a bell through a high resistance and continued working it for 60 days without interruption. So says a circular sent me by Mr. Mayfield. The recharging current must, of course, be a direct one, having an E.M.F. high enough to overcome the resistance and cells, and oppose their fully developed counter E.M.F. It would be safe to reckon on at leasts 2 volts per cell, hence six cells in series will require a 12 volt current to recharge them.—G. E. B.

Dissolving Sal-Ammoniac.—G. J. (*Barnsley*). This will readily dissolve in warm water. A large number of bell fitters put the sal-ammoniac in the outer cell and add the water, allowing the salt to dissolve. The most approved method, however, is to dissolve sal-ammoniac in warm rain water until the water will not dissolve any more, dilute this solution with an equal bulk of rain water, and charge the outer cell with this "half saturated" solution.—G. E. B.

Combination Wardrobe and Bookcase.—WARDROBE (*Glasgow*).—If all would send a rough sketch of what they want—as you have done—queries would be more easily replied to. As you are a working man, I have only given *one* robe compartment; if you do not find that sufficient, increase the width. I have put the doors on the side, as, if they opened in front, you would very seldom have books wide enough to fill the shelves; whereas in the side cupboard no room is lost. Two drawers on each side, and one inside the long cupboard, will, I think, be sufficient. For making these, and also for details of joinery, read late articles, such as "Some Lessons from an Old Bureau," etc; and for one way of making plinth and cornice, *i.e.*, the bottom and top parts, see my article entitled "Combination Bedroom Suite," No. 26. As I intend this wardrobe to be about 3 ft. 6 in. wide, $\frac{3}{4}$ in. wood will be thick enough for most parts. The long door stiles might be 1 in. thick. Silvered glass in the front will look much better, and be more convenient than wood. At each side on the top I have left a handy space for articles of ornament or use. Presuming that you will make it of $\frac{3}{4}$ in. wood, the following will be the measurements. Total width of back-board will be 3 ft. 6 in.; height, 6 ft. $\frac{3}{4}$ in. To this is joined, at the distance



A Combination Wardrobe and Bookcase.

of $16\frac{1}{2}$ in. (inside measurement) from each other, and at an equal distance from each end, two boards, each 6 ft. long and $17\frac{1}{4}$ in. wide. Then a bottom board, 3 ft. 6 in. long and 18 in. wide, is fitted beneath these, and a top board, 18 in. long and $17\frac{1}{4}$ in. wide, will surmount the centre cupboard. Next you require two boards, each 5 ft. long and 12 in. wide, which are joined to the cupboard sides, each forming a side of the book cupboards. At the tops of these, connecting them with the centre cupboard and back of job, are boards each $17\frac{1}{4}$ in. by 12 in. When the plinth and cornice are fixed, the skeleton of the article will be prepared. The length of the centre door will be 6 ft., the width $16\frac{1}{2}$ in. Door stiles will be 2 in. or $2\frac{1}{2}$ in. wide. You will scarcely require the bottom shelves in the side cupboards lower than I show them. The two top shelves will each be $16\frac{1}{2}$ in. by $11\frac{1}{4}$ in.; and the two boards, between which the two drawers run, will each be $16\frac{1}{2}$ in. by 12 in. You can easily ascertain what distance apart you would prefer these shelves, and the size of the drawers. The length of the side cupboard doors will be determined accordingly. In the long cupboard are trays (movable or fixed) for collars, cuffs, etc. One is supported by strips of wood fixed underneath it along the cupboard sides; the other by the drawer framing. The fronts of the trays and drawer must be at a distance of 1 in. from the front, to allow for the thickness of the door. Pediment, shaped pieces, and ornamentation, I will leave to individual choice. These are only bare measurements; you must allow for the various joints.—J. S.

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—T. W. (*Dinting*); E. A. R. (*London, W.C.*); H. A. T. (*Bermondsey*); J. B. (*London, S.E.*); A. H. F. (*Cheltenham*); OXIDE; DIPLOMAS; A. B. (*Manchester*); LIVINGSTONE; HOPEFUL; A. B. (*Bow, E.*); C. H. (*London*); A CONSTANT READER OF "WORK"; TERRA COTTA; J. S. (*Spilsby*); A. P. (*Herne Hill*); C. B. (*Manchester*); F. M.; W. L. C. (*New Cross*); F. T. (*London, N.*); Q. J. E. (*Worthing*); MOTO; A NOVICE; J. G. (*Blackburn*); G. A. D. (*London, E.*); D. W. R. (*Walsall*); J. F. (*Donegal*); F. E. (*Wakefield*); G. S. (*Holmwood*); W. B. (*Leeds*); J. H.; TELEPHONE; THE BRITANNIA CO.; NEMO (*Sandbach*); W. A. Y. (*Cambridge*); MONA; G. W. (*Airdrie*); J. C. (*Rugby*); F. W. W. (*Brixton*); F. McC. (*Birmingham*); A. C. (*Birmingham*); ENGRAVER; F. B. (*London, S.W.*); FRANK AND HUBERT; AQUILUS; AN AMATEUR IN PROCESS OF CONVERSION; W. R. (*Sheffield*); E. A. F.

Trade Note.

FROM the Third Statistical Tables and Report of Trade Unions, compiled by the Labour Correspondent of the Board of Trade, it is satisfactory to be able to give from this report a refutation of the statement often made that the union funds are misappropriated to strike purposes. Thus, the returns of 39 societies, with a total membership of 274,727, had in the year 1888, when strikes were numerous, only expended an aggregate of 2s. $4\frac{1}{2}$d. per member on strike pay. As illustrative of the depauperising benefits resulting from the unions, we note that of those included in this report 32 per cent. have superannuation benefit, 66 per cent. a sick benefit, 70 per cent. an unemployed benefit, and 81 per cent. a funeral benefit. As a result of his investigations, Mr. Burnett remarks:—"Almost invariably a period of improved trade leaves strongly marked tokens of its arrival and duration upon the statistics of trade unions. These indications are shown in various, and sometimes in unexpected, ways. There is in the first place an increase of members; very often, though not always, an increase in the amount of income, but invariably a decrease in ordinary expenditure. Not only is the demand for unemployed benefit less, but very generally the sick and funeral expenditure is less than in years of industrial depression.

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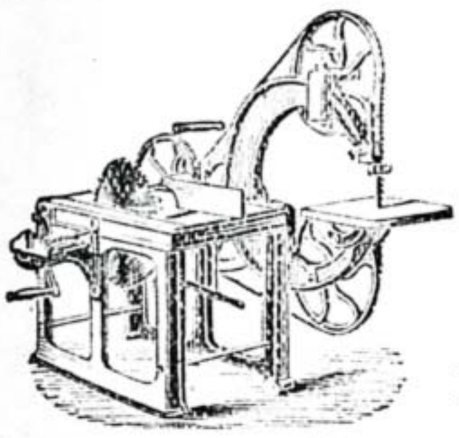

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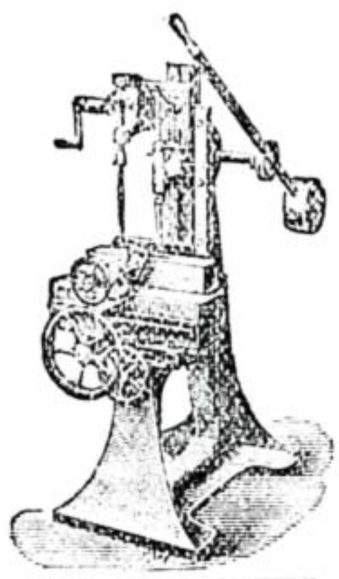

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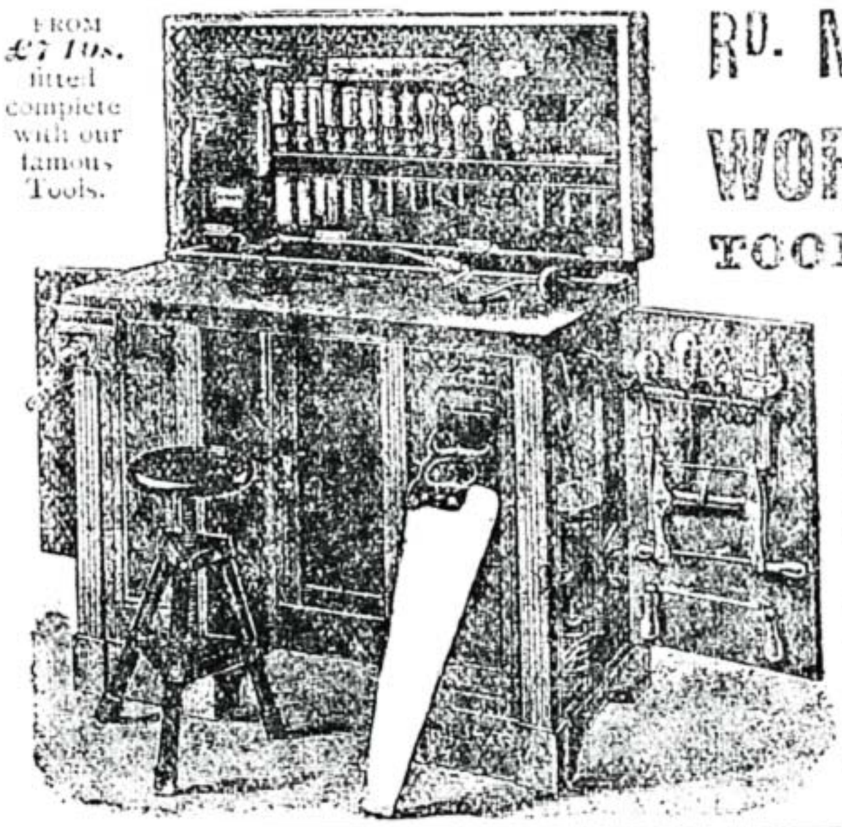

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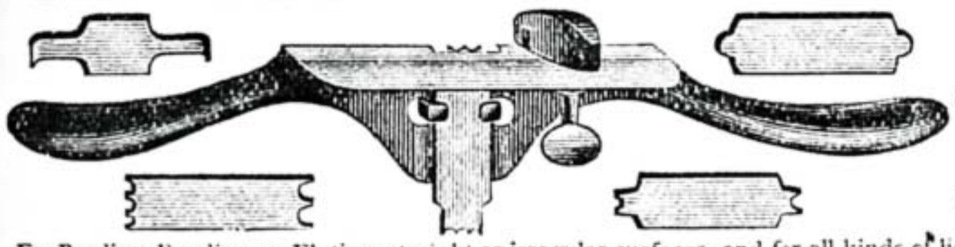

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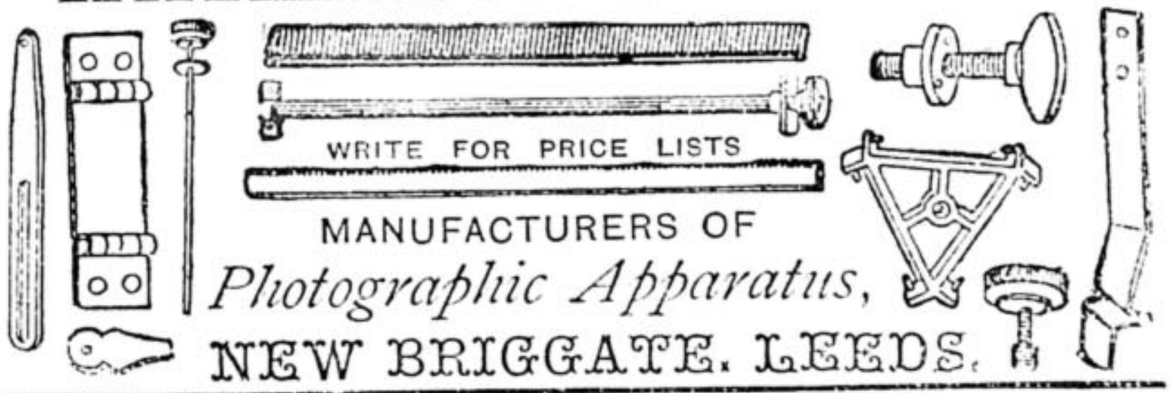

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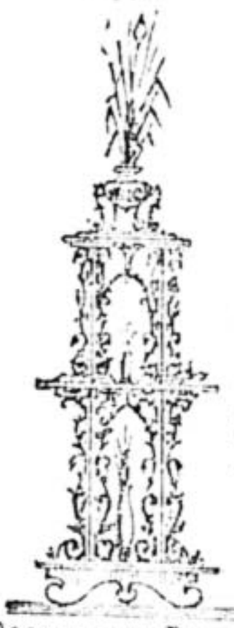

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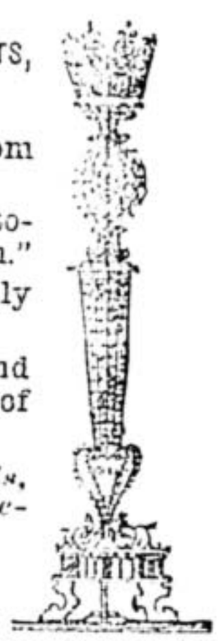

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